MODERN ARCHITECTURAL DESIGN

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By

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Foreword

THE essential aim in the erection of a building of any kind remains to-day very much what it was when primitive man built his first crude shelter. Gradually, however, throughout the ages the actual problem of building has become more complex ; and with increased complexity has come the need for greater method in design.

The architectural problem in the very early days was simple, because daily life was on primitive lines. Effort was directed in the main towards continuing to exist. To-day—the right to exist being taken for granted—our chief preoccupation is that of seeking a finer and fuller expression of existence.

The more rapid the material progress of the world, the greater the demand for the objects which are the by-products of progress ; and the shorter the transition from the stage of regarding these things as luxuries to that of demanding them as necessities.

The march of science has always been reflected in buildings. But, taking architecture as a whole, say from Roman times up to the beginning of the nineteenth century, phases of marked progress have been very widely spaced.

At various epochs the science of construction, for example, made big strides. The adoption of the arch principle by the Etruscans and the Romans opened up fresh vistas in architectural design ; so did the use of concrete for covering wide spans with dome or vault.

And in mediæval times the system of Gothic construction, the vault with the strong arch rib of solid stone and the lighter infilling, rendered possible a lightness of construction which is only excelled to-day in skeleton framing of steel or reinforced concrete.

The structural innovations which characterised both Roman and Gothic architecture were important, because they marked advances in the realisation of the possibilities of building. They left their mark on architecture and affected the course of its evolution.

But while structural design has always formed a fundamental part of the building problem, it is only the corollary of a wider issue, the fulfilment of the building programme.

This building programme has, throughout the ages, been subject to social, racial, and geographical influences. It is not, however, within the scope of this book to examine the programme in either its historical or modern aspects in any detail ; but only to touch upon it in so far as is necessary in any attempt to analyse the contemporary outlook on architectural design. For it is the modern approach towards design, rather than the detailed requirements of various types of buildings, which is to be discussed.

In the process of so doing, ground which is not always fresh will be covered ; and there will be recalled certain principles which, though familiar, compel reiteration with the advent of each new phase of architectural development.

Preface

THIS book is, in a sense, a sequel to *The Principles of Architectural Composition* ; and in it I have not dealt with elementary aspects of composition, except in so far as has been necessary the better to analyse principles underlying modern work.

The book is not a plea for so-called ' modernism '—which is a misleading word—but is an attempt to deal with certain aspects of design from the standpoint of a practising architect of the present day.

No serious attempt is made to define what is ' modern.' If such an attempt were necessary, I can think of no better definition than that which Frank Lloyd Wright has given in the second of his *Two Lectures on Architecture*, delivered at the Art Institute of Chicago : ' Modern architecture is *power*—that is to say material resources—*directly applied to purpose*.'

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Organisation and Plan

In architectural design there are two main problems. One is that of fulfilling practical needs; the other that of procuring æsthetic satisfaction. Both are fundamental. But whereas the first—which may be called the 'rational' problem—can be approached entirely from the standpoint of logic, and its solutions assessed according to definite standards, the second—the æsthetic problem—brings the architect face to face with the infinite variations in human likes and dislikes.

It may be argued that a large portion of the æsthetic satisfaction in any work of art is derived from the observance of certain principles in design, and that these principles are well established and recognised; so that a masterpiece, whatever its position in time and space, will always be acknowledged.

Unfortunately, however, the great bulk of artistic production does not consist of masterpieces; nor is the general public, in the mass, endowed with highly cultivated knowledge or powers of discernment. There is a large amount of work in music, painting, sculpture, architecture, which obeys certain more or less established principles of composi-

tion, but which does not make an appeal to the major section of the community. Furthermore, an artistic production, such as a play, may be an outstanding success in one country, and a failure in another. National taste appears to vary very much as does the individual palate. And in spite of the close contacts between nations at the present day, their peoples continue to maintain their national tendencies, fashions, and enthusiasms.

As a consequence, in discussing æsthetic aims and accomplishments in architecture, it is impossible to dogmatise beyond a certain limit, this being determined by the capacity to agree on certain stable principles which emerge as a result of a common experience. For example, composition is considered to be satisfactory or defective, colour obeys or transgresses such laws as are accepted as basic, scale is correct or false, the conventions are observed or outraged. On matters such as these there is possibility of agreement between critics of all schools and nationalities. But on what ground are we to base appreciation of character, of the actual *flavour* of the work, of the tendencies manifested in it? Should we, to take a topical example, prefer 'Period' or 'Modern' design, assuming that recognised principles of composition are observed in both?

There is, there can be, no authoritative answer to a question of this kind, in spite of lengthy expositions by the champions of rival schools of thought. The reason is that the debate involves a resort to definitions. And there always remains, as the crux of argument, that question which sooner or later is always asked and never answered: 'What is beauty?'

Perhaps it may be agreed that the creative artist is guided by principles which are established on a universal basis, but

that the real essence of his creative force is something which is part and parcel of his own being. The artist produces what he feels, and gives balance to his creations by making use of the collective experiences of others, which are codified as 'principles' or 'laws.' The artist may be an intense individualist, or a revolutionary, to the extent that his art, though perhaps recognised posthumously, is rejected by his contemporaries. Or he may be a fine artist who has the good fortune to obtain recognition in his time. But in either case there is no absolute and sure method by which artistic merit can be exactly gauged. Beauty continues to lie largely in the eye of the beholder, and its essence remains for this reason practically indefinable.

In actual practice it is difficult to dissociate the 'æsthetic' from the 'rational' aspect of architecture, since in any work which is truly designed the æsthetic sense of the designer governs and moulds the handling of practical requirements from the outset. But it is nevertheless theoretically possible to consider the design of certain types of building almost solely from a 'rational' standpoint, and to design as it were by formula according to the material factors present in the particular problem.

This method of approach is a very sound one up to a certain point, for it enables the designer to marshal the facts of his problem in an orderly sequence, and to arrive at his solution through a series of logical steps. Nevertheless, it is precisely during this process that the personality of the designer should intervene if the result is to be architecture and not mere building. If the designer has imagination, he will form in his mind, at an early stage, a conception of a finished building embodying all the factors which have been laid out in systematic order at the outset of his approach to

the problem. On the other hand, an architect of different temperament will continue to build up his design on the basis of practical requirements alone right up to the end, and the finished result will be the expression of the compilation of factors involved. It will probably be more or less straightforward, though affected by certain compromises introduced through the conflicting necessities of the building programme; but it will be satisfactory only up to a certain point. For it will almost inevitably lack that unity which is obtained through the presence, from the outset, of a definite and controlling æsthetic intention.

Practically no two building problems are alike, and experience in one type of building does not, unfortunately, supply the knowledge necessary for the solution of a different problem. Experience certainly gives the clue to the method of approach; but, in general, each building involves its own peculiar set of difficulties. To deal adequately with these difficulties, the modern architect requires to be skilled, in particular, in the art of planning and in the science of structure.

Planning includes the arrangement of all the units of a building, on all its floors and levels; and the success of a really clever planner is due, more often than is generally realised, to his faculty of being able to visualise not only arrangements on the flat, but also the possibilities of adjusting heights and levels to take the fullest advantage of the cubical contents of a building. A great number of fine conceptions in planning have been based on an ingenious adjustment of floor heights, providing lofty rooms where required, and low rooms where permissible. In such cases it is the 'section' of the building which reveals the master planner, quite as much as the ground plan on which figures

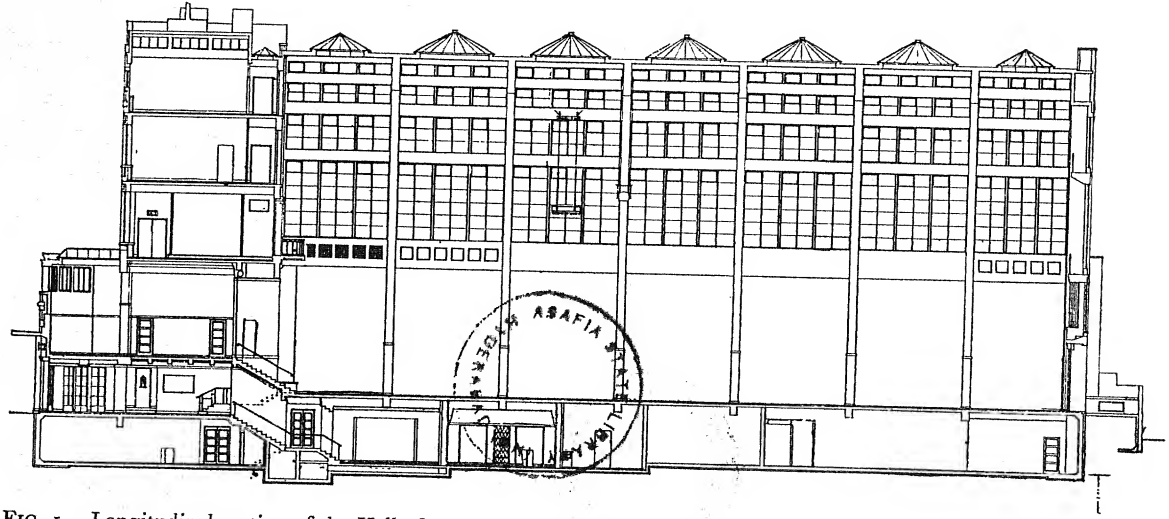

FIG. 1.—Longitudinal section of the Hall of the Royal Horticultural Society, London, by J. Murray Easton and Howard Robertson. The arrangement of the floor levels provided the key to the problem of providing maximum floor area on a restricted site.

the organic layout of the main units. The architect must, therefore, visualise his vertical as well as his horizontal planning from the outset (Fig. 1).

The science of structure, almost equally important as part of the architect's equipment, includes a knowledge of the means available in the past and at the present day for erecting and equipping buildings. It involves a knowledge of all engineering methods of enclosing and bridging space, and of arranging within that space the complicated network of services—heating, ventilation, lifts, lighting, plumbing, fire prevention, etc.—which modern requirements demand. It should also involve, however, that quality of constructive imagination which visualises new methods and new solutions to existing problems. Structure, like design in any form, is susceptible of constant improvement and metamorphoses; it is the business of the architect to transcend existing limitations, to apply his creative faculties to the potentialities of engineering science.

An effective marshalling of the architect's powers in planning and structure lead to what is the fundamental attribute of modern design, namely *perfected organisation*. Good planning is, first and foremost, good organisation; to meet the demands of living, of business, of commerce. 'Organisation' is not a new term, but as applied to architecture it has a fresh meaning; for the organisation of a building's elements, scientifically approached and realised, is something which is of comparatively recent birth. This is true also of that wider field of architecture, town planning, wherein the organisation is applied to the grouping and setting of buildings and groups of buildings as parts of a preconceived and organic whole.

It is clear that in all important phases of architectural

history the necessity for a certain degree of ' organisation ' has been understood. But organisation in the modern sense

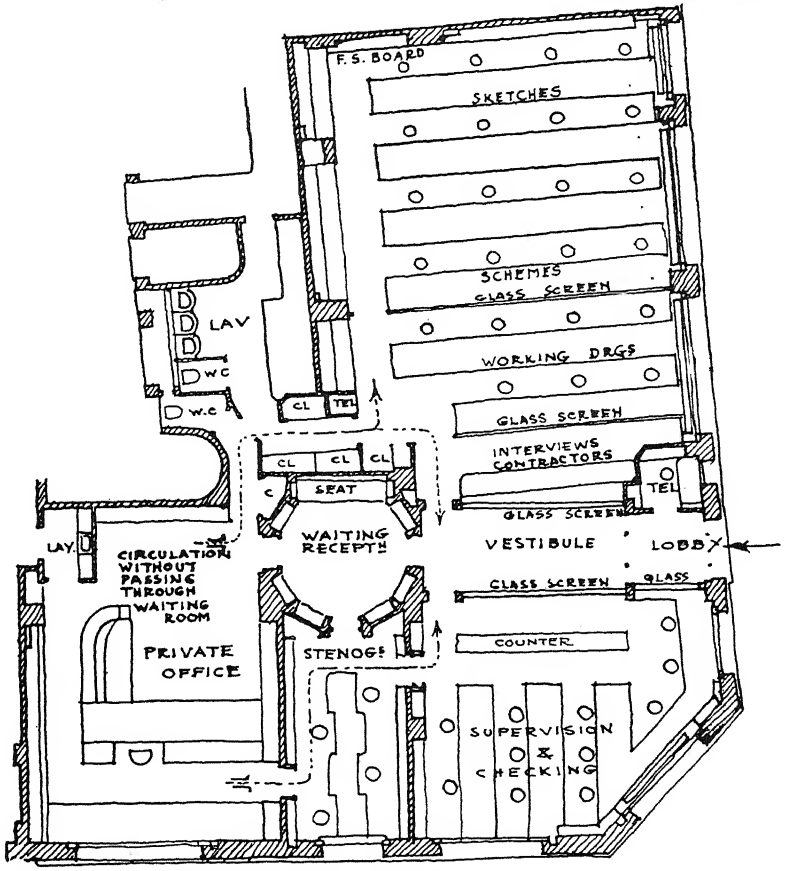

FIG. 2.—Plan of the Paris office of Michel Roux-Spitz, architect. The layout is dictated by the ordered sequence of the processes involved in the preparation of designs, drawings, and in the operations of business management.

implies something intensive, something much more comprehensive than mere adequate arrangement, which in the past has satisfied requirements far less exacting than those

of to-day. It embraces a close analytical and scientific study of requirements, of the service which the building is to perform, a thorough grasp of individual factors having a bearing on the problem, and the faculty of co-ordinating them into a smoothly working unit (Fig. 2).

A scientific approach to architecture through analysis of the function of buildings has not, in the main, been typical of the great historic styles. Planning has been largely concerned with architectural effects; with the maintenance of vistas and axial lines, as in Roman and Renaissance times, with the cult of intimacy, picturesqueness, emotionalism, in mediæval times. Certain æsthetic ideals have held sway, broad impressions of effect have been created, the ' firmness ' and ' delight ' of Sir Henry Wootton have unquestionably been attained. But the other element of Sir Henry's redoubtable trio, ' commodity,' has received far less attention. People have put up, for centuries, with inconvenience, wasteful planning, inadequate lighting, ventilation, and heating—all the elements of ' inhabitability ' in fact—for the sake of non-interference with the grand rhythm of the general architectural conception. Histories of architecture, monographs of famous buildings, are stuffed with examples in which architectural distinction goes hand-in-hand with what we consider to-day to be waste and inconvenience of plan. It may be objected that the inmates of historic buildings were well served by architectural planning according to the needs of their day; but the fact remains that the practical achievements of, say, 18th Century architecture, were far in arrears of the cultural. The demand for practical ' service ' from an 18th Century building was evidently slight. If it existed, architects were in the main too lacking in skill or ambition to supply it; and

inconvenient planning, with amenities sacrificed to elegance, was tolerated all over the civilised world.

One explanation lies in the comparative extravagance, or rather spaciousness, of the period. Even in the early part of the 20th Century the lack of facilities and equipment in buildings of all types appeared to be a matter of little moment. Business premises, workshops, lawyers' offices, could be dark, ill-planned, and inefficient; it was of small importance, where pressure on the human machine was slight, and innumerable clerks and apprentices were at hand to perform the chores. The same observation applied to the home. What did it matter that there were innumerable coal fires and oil lamps, when the domesticity camped in kitchen quarters and attics was almost as numerous as the population of a small village? What did it matter that the 'twenty bed- and dressing-rooms' shared a single wood-encased bath tub, when there were plenty of well-trained maids to set out 'tubs,' and huge brass cans of hot and cold, in the hours before the breakfast and the dinner gongs? Space was at a discount; client and architect could afford to waste it. Labour was cheap, almost cheaper than the effort to avoid it. Comfort and elegance for rich people, discomfort and even squalor for poor people were taken for granted in the 'good old days,' and the material prosperity of the upper classes was such that business interests felt no call to spend good money on efficient buildings and workers' welfare. The seeds of an architectural stagnation, on everything but the cultural side, were well sown.

In the planning of buildings, the architect is dealing with the utilisation of space which he encloses by walls and roofs. In town planning, the architect also deals with space. He establishes in it units of buildings, open areas, and avenues

of circulation. As in the single building, he considers space not only as length and breadth, but also in its third dimension of height. Architects of the modern school are cultivating, as one of their principal assets, a grasp of the third spacial dimension, of which the development of aviation has made them vividly aware. The increasing use of models, for the study of the design of town layouts and individual buildings, is one evidence of this tendency, which is also exemplified in the skilful adaptation of plans to sites with varying levels, and the obtaining of effects of spaciousness within comparatively limited dimensions (Fig. 13, page 32).

The science of planning, directed not only towards practical arrangement and equipment, is nowadays extended to include the art of utilising space to produce its absolute maximum of value, not only as area actually and materially available, but also as surface conveying a visual impression of amplitude (Fig. 4, page 21).

Previous to the present-day congestion of town and suburb, and under the more spacious of the economic régimes, planning of buildings has been on comparatively ample lines. The sensations of fine planning have been obtained in a direct way, by a careful proportioning of individual rooms, a studied relationship of the shape and size of each apartment to those of its neighbours, and by the creation of vistas and the establishment of focal points of interest. Space was, in the main, sufficiently ample in itself to ensure effects of amplitude, and it was scarcely necessary to scheme for any optical illusions of size. Such devices as false perspective, employed in the Renaissance of Italy and France, can hardly be considered seriously in this connection, for they were more in the nature of decorative whimsicalities than serious efforts to deal with cramped dimensions.

To-day, however, the greatest ingenuity is directed towards this art of 'space production.' The scale of the customary internal elements of buildings, such as walls, ceilings, doors, windows, fireplaces, furniture and fittings, undergoes a careful scrutiny from the standpoint of relationship to the area which is being dealt with. It is rare to find in modern planning, for example, small rooms of great height, with enormously tall windows, huge fireplaces and broad doors, such as occurred in old work up till the end of the 19th Century. We all know these rooms, which were treated with exactly the same sized elements as adjoining rooms of perhaps twice the area; *e.g.* the study and the drawing-room of a large London house. Wall space in the former room probably exists little in actual fact, and still less in visual impression; for the window dominated one wall, the fireplace another, and on the third the door and its broad wooden architraves spread its massive area of mahogany or paint.

A room of similar size to-day would be treated far more carefully, for the reason that a room of the type which fifty years ago was an unimportant study or morning room in a house, is now perhaps the principal living-room in a maisonette. Smaller areas, and lower floor heights, are factors which to-day affect the entire conception of treatment and furnishing.

The window in the modern room may be just as large, but it will probably be horizontal—long and fairly low—for it is an effect of lateral space, not of height, which is being sought; and the broad sweep produces its effect of amplitude. The fireplace, too, is lower, and though no broader, it appears to be so on account of its more horizontal proportion. Our chairs are not high-backed, for the vertical line of high

chair-backs creates disturbance to the atmosphere of serenity and repose which we are hoping to establish. In big rooms this may not matter; but now we are trying to produce our effects in a limited space.

Our door will perhaps be placed in the angle of the room, even across the corner if the planning so dictates. By placing it thus, we procure for the person entering the room a view across its diagonal. The diagonal is the longest dimension; we are trying to induce our visitor to see the room, at first glance, in its most spacious sense. Our lighting will probably be disposed, not in the centre of the ceiling, where it breaks up the biggest plain surface which we have, but in diagonally opposite corners, and probably low down. By this device we again stress the diagonal, and by keeping the light-source low we enhance the sense of scale, and allow on the walls space for the play of light and shadow.

Every article in the room, by its size, shape, and disposition, may contribute to this effect. In a room we are dealing chiefly with furniture; but what is possible with mobile elements such as furniture is possible also with the fixed units of buildings, such as partitions, staircases and openings.

All of these elements can be schemed to heighten the illusion of space. Divisions between one room and another need not always be carried up the full height to the ceiling, or the tops of them may be treated with mirror or other reflecting surface; in this way the ceiling can be seen extending, or appearing to extend, over and beyond the first room to the second. The eye detects the distant space, and is attracted by the suggestion of ample surface. The same thing happens in the case of galleries which give on to a room below. It is quite a common device in America, and

to a certain extent on the Continent, to provide one fairly large living-room which is tall enough to have a gallery across one end. From the gallery the room below, seen as it is diagonally, appears spacious. Conversely, the ceiling of the room, viewed from below, is seen to pass over and beyond the balcony rail, to end at a wall which lies somewhere beyond, its precise location probably concealed by the advancing perspective of the balcony floor. This sense of ceiling space, the physical limitation of which is not determined to the eye, assists in creating the illusion of amplitude. A frequent use of such effects is made by many modern architects, notably Le Corbusier and Jeanneret, who in houses in Paris and at Garches have planned with great attention to creating an atmosphere of size, utilising in both cases halls which have open wells, permitting glimpses both up and down of space beyond the actual areas in which the spectator may be standing (Fig. 7, page 22).

Thus it can be seen that in planning for spacial effect certain guiding principles can be suggested; and these may be amplified by experience. Under present conditions, it is obvious that this section of planning science—though still in its infancy—is of importance, and should be borne in mind when considering those elements of structure and working function which have been already alluded to under the heading of plan organisation.

The architect, in preparing the plan of his building, is of course bound to consider from the outset the structure through which his plan will be realised and developed into the covered space which is the finished building. The purpose of structure is, however, to secure the execution in appropriate and practical materials of the architect's idea. In other words, the system of structure should not under

ideal conditions create and dominate the plan conception, but should serve it. This is a principle easy to lay down, but more difficult to follow out in practice.

The reason is that simplicity and economy of structure, and flexibility of plan arrangement, do not always go hand-in-hand, though this incompatibility may disappear when methods of construction become less rigid and better adapted to meet the increasing modern demand for flexibility and free uninterrupted space.

In steel and concrete frame buildings, for example, an even distribution of points of support, forming a square or rectangular grid of comparatively restricted spans, has been found to be simple to design and economical to construct. The unit system, however, while simplifying construction, may be inconvenient as regards internal arrangement. There may be too many stanchions, at too frequent intervals, which break up the floor space and occur inconveniently in respect of the main divisions of the plan. In a restaurant, for instance, too many stanchions are undesirable, since they restrict the arrangement of tables, and destroy broad effects of treatment; managers of restaurants generally detest them. In a theatre auditorium, stanchions are of course unthinkable, and in hotel planning the stanchion spacing and the unit width of bedrooms have to coincide exactly if awkward results are not to ensue. The designers of the Dorchester Hotel have realised this, and in adopting a very ingenious system of reinforced concrete, have not only concentrated their loads on the lower floors at a few points, but have avoided columns altogether on the upper floors and obtained ceilings remarkably free from unsightly beams (Fig. 3).

Even in big shops, of the type in which large open areas

are desired, the grid of stanchions is often highly monotonous, and here again counters and 'islands' must all be planned out beforehand, and the stanchion spacing must be such as to coincide with a counter arrangement suited to the

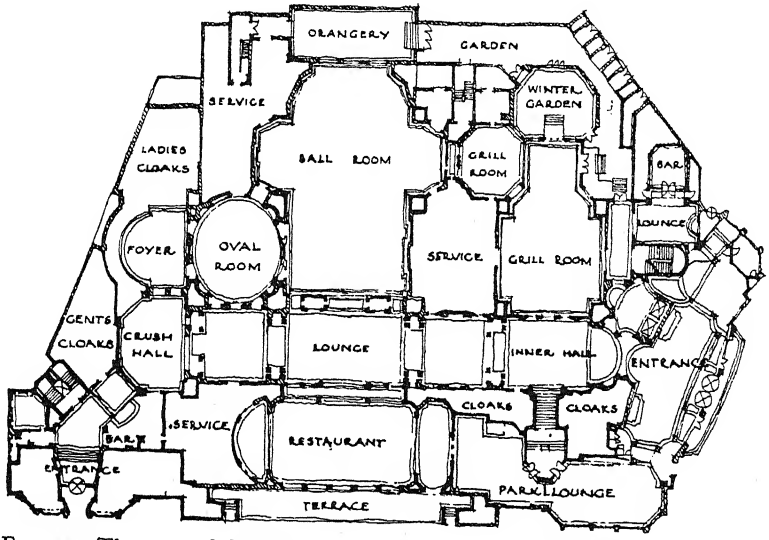

FIG. 3.—The ground-floor plan of the Dorchester Hotel, London (W. Curtis Green and Partners) is remarkably free from stanchions. Loads are concentrated on a few widely spaced points of support.

business. Once fixed, the stanchions constitute a rigid arrangement; and changes of plan conception are only possible within limits.

Theoretically, therefore, while the use of the structural unit system has advantages, in practice it frequently limits planning, and this is entirely contrary to modern ideals. For under present conditions flexibility and mobility are highly desirable possibilities in plan layout, where business conditions and methods may alter from year to year under the stimulus of keen competition.

The complete solution to present difficulties is not yet to hand, and as a rule the designer must choose between wide spans, with increased depths of beam, and lighter units at closer spacing which may interfere considerably with the function and amenity of his building.

Nevertheless, the consideration of planning as 'organisation' arises. For it is possible, by co-ordinating all the principal elements in the building problem, so to group them that they effect a maximum of economy consistent with the maintenance of the planning amenities desirable.

This task, constituting under modern conditions a vital, yet little appreciated function of the architect, is akin to that of the commander planning a campaign, in that the greatest forethought, imagination, and definition of objectives are all elements of future success. But the architect is not dealing with divisions and brigades; the units which he has to regulate and command for the success of his undertaking are the architectural elements of the building on the one hand—the windows, doors, corridors, staircases, and beams, stanchions and walls—and on the other the 'services' of equipment—the systems of water supply, heating, cooling, ventilation, drainage, lighting, cleaning, elevators, fire protection, sound deadening, intercommunication, etc.

The old-fashioned building had practically no 'services.' The question of organising them, and dealing with their multifarious and insistent claims, did not therefore arise. But to-day these services are becoming increasingly numerous and complicated. They form a veritable network of shafts, ducts, conduits, and pipes, which beneath the smooth coating of the finished interior spread with the intricacy of the veins beneath the skin. And not only are they beneath the surface; they obtrude themselves, rudely at times, and

insist on occupying, not only odd corners and the thicknesses between floor and ceiling, but also large areas of space which must somehow be conceded to them without jeopardising the amenities or the financial return which are expected from the building. Heating and ventilating ducts, for instance, occupy a relatively enormous volume of cubic space. When they are neatly disposed above a corridor ceiling, their presence revealed only by the symmetrical grids of 'intake' or 'exhaust' and the reduced height of the corridor, we scarcely notice them. That is organisation. But when huge ducts curl, snake-like, round corners and up wall faces, as very often happens, it simply means that the planning system has broken down. The general has overlooked the services of supply to his army, and they have been dragged in as a ragged afterthought.

A modern building plan is first drafted out as a sketch scheme, in which the general conception is made clear. But hardly has this scheme reached the stages of general approval than the question of services arises. Lifts, main and escape staircases, ventilating ducts, and in particular—alas! —lavatories, offer themselves as successive obstacles. They are all subject, not only to the dictates of convenience, but to innumerable and frequently out-of-date regulations, originally drafted for the public safety, but rendered obsolete and unnecessary through the advance in modern building practice. The arrangement of these particular services which are the pet protégés of the public authorities is a problem so difficult and sometimes so limited in its possibilities of elegant solution, that it practically dictates the the rest of the plan. In the City of London especially, the whole conception of a building may be subject to permissions in respect of the location of lavatory blocks.

The architect-general's army is therefore apt to be fractious and even insubordinate. Tact and experience, coupled with a knowledge of human nature and legal strategy, are required at this early formative stage. And what applies to these adjuncts to the general plan applies also, in even greater measure, to the legal business of architecture, questions of light and air, covenants, party wall disputes, and the rest of the harassing troubles which join forces to hinder the aim of putting up a building.

The task, then, is to scheme not only for the general purpose of the building, but to apply the talent for orderly and efficient arrangement to even the most minute section of the building's equipment, such as the location of electric light points, draw boxes, etc. For example, it is unfortunate if, in a carefully designed marble or parquet floor, it is necessary to provide an access panel so located that it does not coincide with one of the figures of the floor pattern. If that happens, it is bad organisation, excusable perhaps, but regrettable. Everything, however small, must fall into its proper place, and by 'proper' is meant not only suitable, but æsthetically acceptable.

The necessity for thinking, at the very earliest stage, of what may be considered to be the secondary elements of the plan, *i.e.* the 'services' of equipment, has been stressed. And the reason is, that in practice such consideration is a necessity, and the well-trained architect, in the midst of preoccupation with detail, will nevertheless not run the risk of failing to see the wood for the trees; for he cannot organise small things without reference to the general conception of which they form a part.

Organisation = Order. Order — clear, neat, logical arrangement—is the modern handmaiden of beauty.

If we accept order as an ideal, we must then trace its effects on the plan, from the practical and æsthetic standpoint, and try to suggest the processes by which it may be achieved.

In the architecture of the past, generally speaking, the major effects of planning have been achieved by the arrangement and proportioning of spaces—rooms, corridors, halls—but also by their architectural *treatment*. This matter of treatment has always played a major rôle. In its origins it was based on structure; and then later it may be seen to become merely an application. A good example of this divorce of treatment and structure occurs in use of the vault. Originally the vault was genuine, and structural, as employed, for instance, in the vaulted halls of the Baths of Caracalla. Later, the vault is reproduced in other materials, purely as a decoration, and loses its structural significance, as in the Waiting Hall of the Pennsylvania Railway Station.

In both these examples, however, it is the character of the treatment which counts, the sensation produced by the vaulted roof and its symmetrical system of supports. Take away the *décor* of the Pennsylvania Station, and what is left is a bare rectangular apartment, with a flat ceiling, devoid of any particular character or interest, though possibly still tolerable in proportion.

Now, in the ultra-modern building, that is practically what has happened. The tendency is for all these features of applied treatment, no longer structurally significant, to be removed. Modern construction no longer demands vaults and Corinthian columns and entablatures from which they may spring. The elements are stanchions, floor slabs, and the light walls which enclose and subdivide space. These are elements of a different order, to be disposed practically for service, æsthetically for effect.

The essential character of these elements, decoratively considered, lies not in mouldings, in surfaces broken into pilasters and raised or sunken panels, or in enrichments, but in their shape, and the extent and quality of their surface.

The major *æsthetic* task is, therefore, to deal interestingly and appropriately with form. It is this preoccupation with basic, what one might call 'naked' form, which distinguishes modern architectural design and marks it out as a distinct phase in evolution.

The potentialities of form as regards effects of space have been already alluded to. But the results of combinations of form and light—both natural and artificial—are also an important element. Let us take, for instance, two examples from Ragnar Östberg's Town Hall at Stockholm, the 'Blue Hall' and the 'Golden Hall.' Both these apartments depend very largely for their æsthetic effect on the handling of their natural lighting. The Blue Hall has a continuous band of light between its walls and canopied ceiling. The latter seems to float airily above the space which it covers, and it is said that Östberg would have preferred, if it had been feasible, to have made his range of clerestory windows even lighter in their effect, by the reduction of the mullions and the use of huge sheets of plate glass. Still, as it stands, the effect of light dominates the sensation of this Hall, gives the character and vitality to its form and surface decoration. The light is the major element (Fig. 6).

In the Golden Hall the windows are set in deep niche-like reveals. On entering this Hall, the eye perceives the shimmering of light on the golden splays of the window recesses; but it does not see the *source* of light. The glare of the direct daylight, seen through the window glass, is not visible; the gold mosaic of the walls glows, and its gleam is

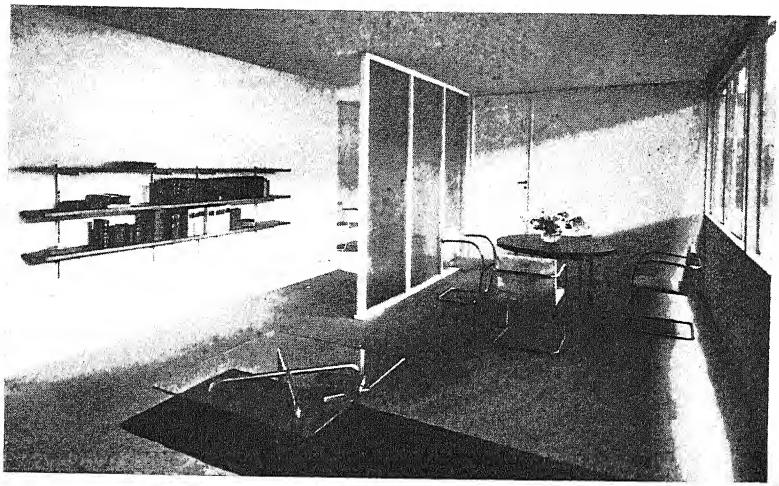

FIG. 4.—Design for a Living Room in a five-room flat, exhibited at the 1931 Building Exhibition in Berlin. Karl Otto and J. Ruhtenberg, architects. The effect of space is created by stress of form, lightness of material, and the creation of an illusion of a ' beyond ' distance.

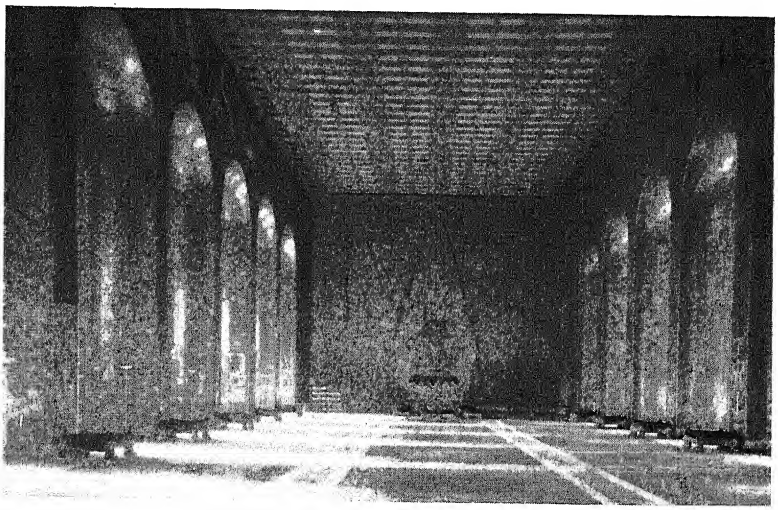

FIG. 5.—The sources of daylight in the Golden Hall (Stockholm Town Hall) are masked by deep window reveals. Ragnar Östberg, architect.

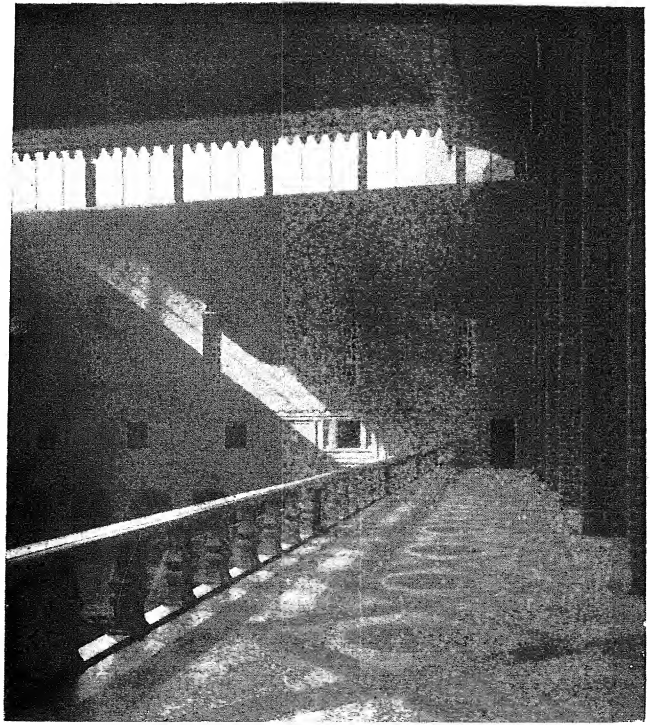

FIG. 6.—The clerestory lighting of the 'Blue Hall' at the Stockholm Town Hall is a bold and magnificent conception. Ragnar Östberg, architect.

FIG. 7.—The Hall of a house in Paris, by Le Corbusier and Jeanneret, in which a sense of space is developed both in form and colour.

not quelled by the harsh values of direct daylight directed into the eye of the spectator. The Hall is magnificent in form, scale, and decoration. But its major decorative effects are based on the imaginative combination of form and light (Fig. 5).

In both these instances the effects are obtained by a particular placing of the source of light, which does not directly strike the eye. But in a great many cases it is neither practicable nor desirable to plan the windows in this way; and even with absolutely direct light there is much to be considered in respect of form.

Let us take, for instance, the corner-window. This is not an absolutely new element, but it has been exploited to a considerable extent in very modern work. Many critics aver that the corner-window is a 'stunt,' introduced for its external effect; and so it is in certain cases where there is no demand for it internally. Properly used, however, it is a useful element, for it has the special property of lighting all four walls of a room, whereas a window in the centre of a wall leaves that particular wall in semi-darkness. The spaces on either side of such a window appear, in practice, almost black by contrast with the source of light.

The dark masses of this window wall form a unit which is in disruptive contrast to the remaining illuminated wall surfaces. They break up the effect of unity which is obtained with four walls more or less evenly lighted, in just the same way that a wide dark door breaks up the surface of a white wall.

In a large room dark accents may be desirable—all depends on the effect desired—but in a small apartment patchiness of this sort diminishes the sense of size; most people have discovered, for instance, that in a very small

apartment one of the surest ways of achieving a feeling of spaciousness is to decorate in the same colour throughout, and keep the colours of doors and window framings in the same tone as the walls.

Here is a case, therefore, where the planning of light sources has reactions on form, and where it can be considered by the planner in the production of certain desired effects.

Not only is the question of interior light of interest in utilising the corner-window, but also the effect of the view obtained. An angle window occurs on the diagonal of the room, the greatest dimension in the case of a square or rectangle. In looking at a view through such a window the eye therefore travels along the line of the greatest dimension, which increases the sense of perspective in the case of a spectator who is placed well back in the room. And the fact of the opening spreading along two walls has also the effect of widening the angle of vision, so that the eye covers an unusually ample range, in the same way that the wide angle lens of a camera includes a broad field. This lends to the view a particular charm and sense of openness—which must be experienced to be realised—and in the case of a window glazed with large sheets of plate glass, connects the interior with the exterior in a manner calculated to create an atmosphere of openness and distance.

In point of fact, the large window of plate glass can be made to assist in this effect whatever its position, and its proper use in small rooms enhances effects of spaciousness by linking up the vista with the interior. The small cottage window of the past, with its frequent mullions and latticed panes, produces different effects of charm and intimacy, and helps to maintain a small scale. But it does not suggest

breadth and vision; and it is perhaps not unkind to suggest that its maintenance in small houses tends to perpetuate in their inhabitants a cottage type of mind (Fig. 11, page 31).

A further point in the disposal of window openings relates to their height from the ground, and here again possibilities are opened up. The average window has its sill some 2′ 4″-3′ 0″ from the ground, a very convenient arrangement in many cases. But it is not the only arrangement. The proof is seen in the Hall of the house at Garches by Le Corbusier and Jeanneret, where is a window which has a sill at the normal height, while below this sill is another window descending to within a few inches of the floor. The effect of this lower window is to flood the floor with light, so that carpets and rugs, which normally are in shadow from the wall between floor and sill, are strongly illuminated. Floors may be beautiful things, of rich material, or covered with fine rugs. The system of lighting which Le Corbusier and Jeanneret have adopted creates a particular effect by illuminating these things, and the form of the room is affected by the arrangement. For the floor acts with more than its usual intensity as a reflecting surface, and attention is specially drawn to it. With the result that, in theory and practice, the eye not only takes in the walls and ceiling as illuminated surfaces, but travels to the floor as well. In this way an additional surface is forcibly included in the range of attention, with a resultant sensation of enlarged space (Fig. 10, page 31).

These few examples serve to show to what extent a close study of the latent possibilities of the study of form, and of the elements which react on it, can assist the designer who is sufficiently alive to consider them.

Effects derived from pure form can, of course, be

enhanced by decoration and furnishing, and particularly by colour. The modern designer with a skilled technique of course realises this, and uses colour to emphasise effects already established through form alone, and to assist in obtaining desirable effects which are rendered difficult through practical limitations.

Suppose, for example, that the architect is dealing with a series of three rooms, all communicating with each other through wide openings, and that these three rooms are of restricted dimensions, the cramped effect of which it is desired to minimise. The first room, the entrance hall, may be painted white, a colour which is brilliant in its reflection, and which has both the property of creating spaciousness and of maintaining itself in the foreground. The second room may be painted a pale buff. It is a softer tone, more 'receding,' less reflecting. It will take its position in the middle distance, and the whole room will, by contrast, 'advance.' The third room is painted a pale blue. Blue is a 'receding' colour, the colour of distance; a blue door, seen from a long way off, will be imperceptible where a red door is distinctly visible. Consequently our blue room fades into the background, and seems remote. Viewed from the white hall, its far wall appears to be relatively a long way off.

Thus, by the arrangement of colour, a sensation has been produced which would not have been possible with form alone.

Externally, similar effects are possible. In a series of blocks of houses of similar type, such as are found in housing schemes, colours may be used to accentuate placing. Houses appearing against a background of trees, for instance, will be less emphatic if painted in a blue or green which, from a distance, dissolve into the tones of the foliage.

Here, then, are a few of the more unfamiliar factors which may enter into the scheme of architectural organisation. They are not new, but they can be regarded in a fresh light. The task of the architect is to use them scientifically for the benefit of his conception.

Whatever the function of the building may be, the aim in planning is the same. It is to produce practical service, and to create, in the process, order and harmony in the plan. Nearly every room in a building has its distinct function; nearly every building in a street has its distinct function too. In both cases the units must be ordered as parts of the organic whole.

In the problem of determining the plan there are five important processes to be distinguished, which may be tabulated as follows :

(1) The analysis of the requirements of the ' programme,' and their arrangement in orderly sequence, a process which may require a regrouping of the elements of any programme which has not been carefully and logically drafted.

(2) The placing of the plan elements in their proper position on the site, a process involving study of questions of convenience, amenity, economy, etc. This process makes great demands on the designer, for at this stage the most important decisions are made, affecting the validity of the solution (Figs. 8 and 9).

(3) The arrangement and adjustment of the principal elements in respect of each other, study of the elements of circulation, junctions, subsidiary services which depend upon the main elements, and the general proportioning, shaping, and ' patterning ' of all these units considered from the standpoints of practical service and æsthetic quality.

(4) The study in detail of each principal and subsidiary element, its modelling and treatment, and the introduction of refinements in planning; some of these may have been indicated during processes (2) and (3), but this section of plan study should not receive concentrated attention at too early a stage, lest it distract the designer from proper consideration of broader aspects of the plan problem.

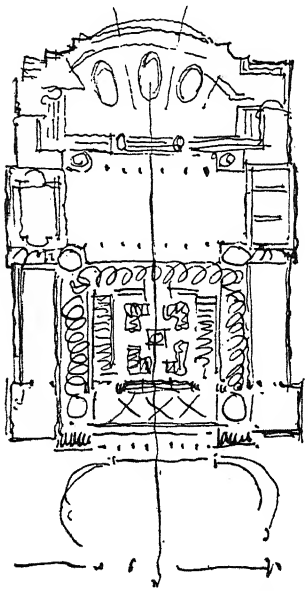

FIG. 8.—A preliminary sketch of the Pan-American building, Washington, by Albert Kelsey and Paul Cret, in which a tentative solution emerges.

(5) The examination of the plan as a whole from the point of view of correct scale, involving a 'checking-up' of actual sizes, in order to make certain that, in the process of working, elements which have an irreducible minimum of dimensions (*e.g.* walls, staircases, corridor widths, etc.) have not been allotted sizes which in reality are impracticable. This process is particularly necessary in studying large schemes at small scale, for if it is neglected the designer may find that his plan, when developed to a larger scale, will not work. It is to avoid this pitfall that many architects of experience work on squared paper, which enables them to check sizes automatically as they proceed, in addition to obtaining, through the use of the unit square, a basis of geometrical rhythm and harmony.

The progress of plan study outlined in (4) is extremely

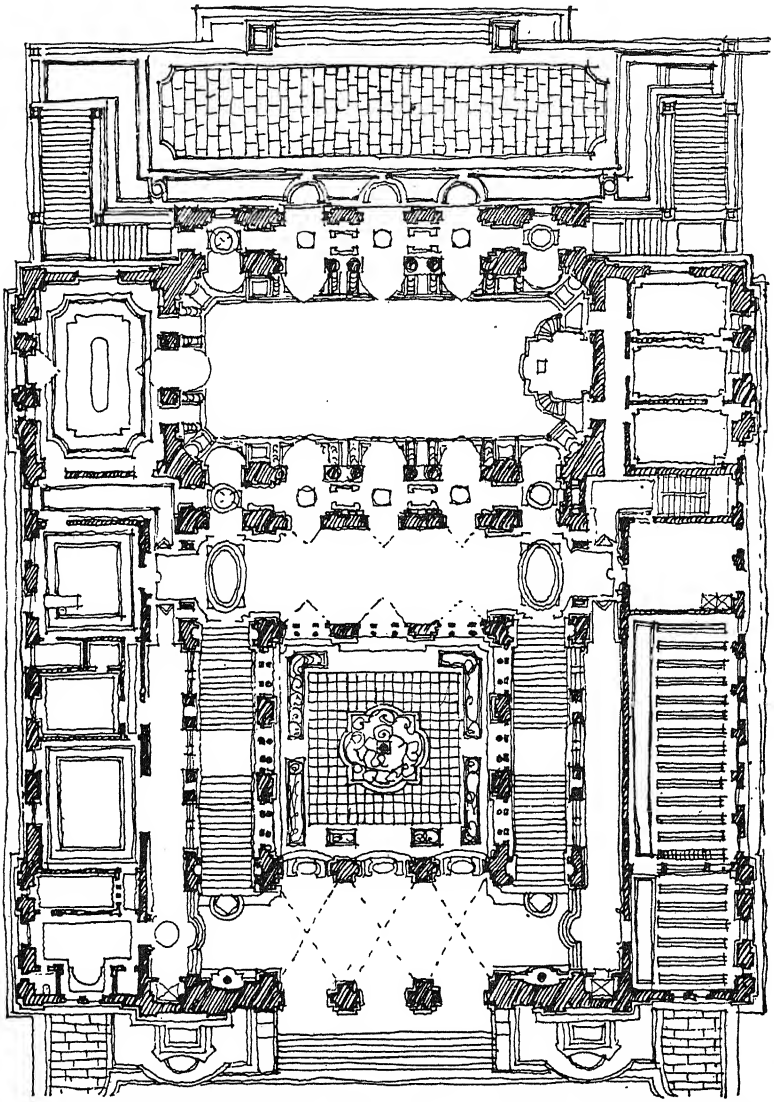

FIG. 9.—The finished plan of the Pan-American building, Washington, based in its main lines upon the original sketch solution.

important, for it involves a critical examination of each element of the plan from the standpoint of its logic, as well as from that of its architectural effectiveness. It may well happen that during this process the designer may decide largely to recast his plan, finding that some important consideration is neglected on account of the general solution which he has adopted. It is at this stage, too, that elevation and section will be more closely examined, though naturally the trained architect will not have neglected possibilities of elevation and section from the outset, it being hardly necessary to stress the fact that consideration of plan should never be divorced from that of elevational form.

One of the chief aids to the architect in the pursuit of order is understanding of the importance of the ' axis.'

The axis is an imaginary line which is established on the plan diagram to fix in the mind of the designer major and minor lines of plan development; it is a visual reminder, on paper, of certain sequences of space (rooms, halls, corridors, etc.) which the architect thinks desirable to relate to each other in an important or emphatic way.

The architect has, in his schedule of planning requirements, certain units which are related to, and dependent upon, each other. This relationship sets up a sequence of activities which on the plan are typified by communications, services, separate or mutual dependencies. This sequence of events demands development, for it is an outstanding feature of the problem. The connecting line in this sequence, drawn on the paper image of the plan, is the axis. The axis is, therefore, a line illustrative of intended development.

In monumental and formal planning, it frequently happens that the line of development passes through the centre of the building, because the activities of a large building are

FIG. 10.—The Hall window in this house at Garches by Le Corbusier and Jeanneret is extended down to floor level, and provides a splendid illumination to fine floor coverings.

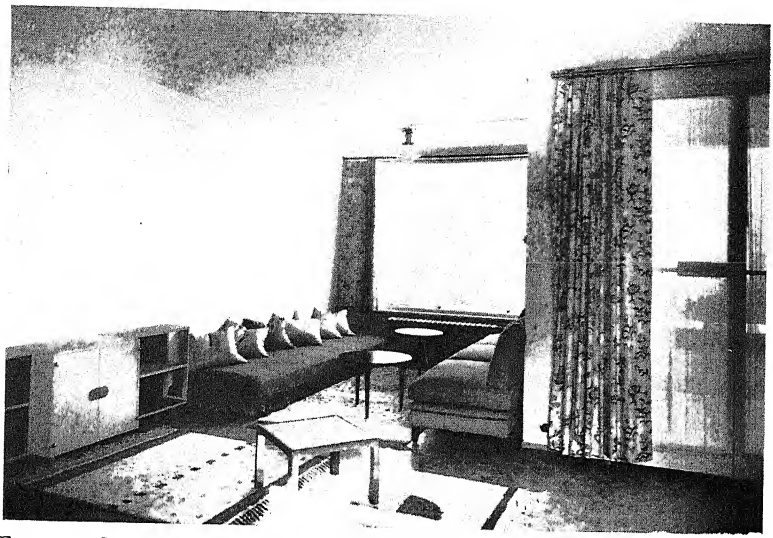

FIG. 11.—The large window in this Stuttgart house by Josef Frank creates a sense of amplitude by its unbroken framing of a distant view.

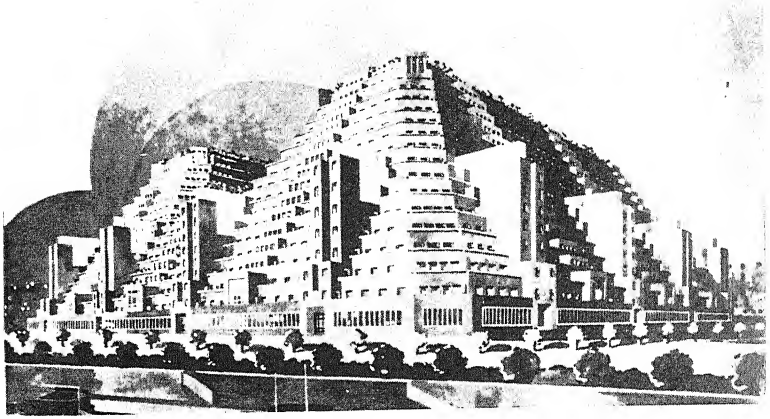

FIG. 12.—This terraced conception for a modern hotel, by Henri Sauvage, would be practically impossible were it not for the resources of modern structure.

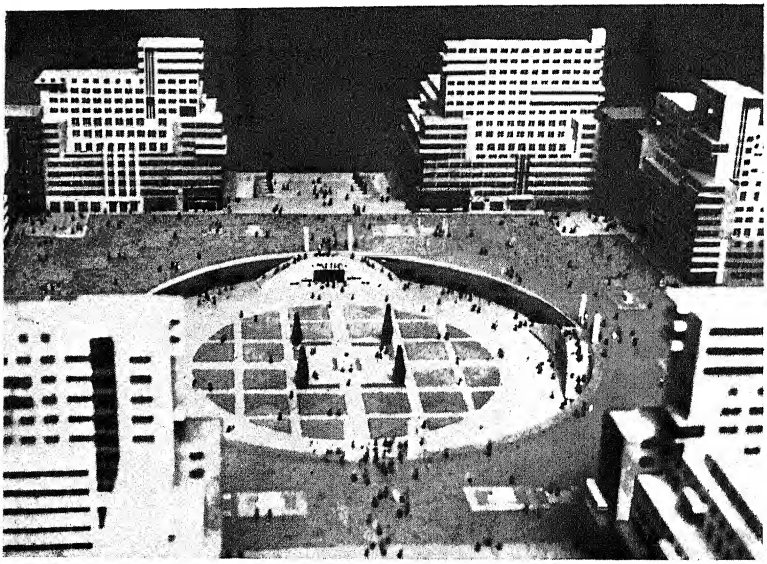

FIG. 13.—A model showing the proposed layout of a Parisian square, utilising circulation at two levels. André Ventre and E. Ailland, architects.

frequently symmetrically disposed; *e.g.* the entrances to a large hall will be in the centre of one wall, these entrances will lead centrally into the adjoining vestibule, the door from the street into this vestibule will not only be in the centre of the vestibule, but also in the middle of the street façade.

Symmetry assists formality. It has qualities of repose and dignity; its essence is complete balance and equilibrium. Hence it is adopted very frequently in buildings where formality is a desideratum; and also, unfortunately, in many minor buildings in which formality becomes a cloak for pretentiousness.

As a result of the prevalence in practice, and particularly in public competition designs, of symmetrical planning, the axis has come to be considered purely as a centre line. As such, the axis seems to have an almost hypnotic effect on both competitors and assessors, and competition work to-day frequently suffers from the vogue of the axis. The competitor who sets out to win almost inevitably forces his plan into a symmetrical shape; and while the symmetrical plan is frequently the most economical, and in use has the advantage of being obvious and easily comprehended, there is a danger of it becoming a fetish. This is regrettable, since in actual fact the over-zealous cult of the centre line may result in extremely dull and likewise unsound effects, particularly in buildings of the smaller type whose dominant elements do not naturally group themselves into equally balanced masses.

Regarded as a line of development, however, the use of the axis cannot be otherwise than helpful, as a constant reminder of intention. Its presence on the plan not only makes clear the main idea of sequence; it helps in the orderly establishment of minor units which should occur

along the line of that sequence. It is natural, for instance, that a sequence of connection between an entrance vestibule and, say, the principal gallery of a big museum should be interestingly developed. If this big gallery is the climax of the plan, the focal point of interest in the composition, its approaches should be adequate, and there should be graduated preparation for the sensations which the climax is to produce in the mind of the visitor.

The establishment of the axial line between the entrance and this big gallery is a means of setting down this intention on paper. Along this line the architect establishes, orders, and develops his effects. Its presence restrains him from wandering away from his main governing theme into side issues, and focusses his attention on the principal objective.

Any plan which is muddled and confused, although interesting in idea, can be subjected to a process of 'cleaning-up'; in other words, it can be brought into the first semblance of order. This is accomplished through the establishment of the main and minor axes—lines of development—which, like clear statements in an argument, set out the cardinal points at issue.

The axial line, which is not necessarily a centre line, need not be even a straight line. It is not indispensable, for fine effects, that one should always pass down the *centre* of apartments, nor that vistas should be continuous. On the contrary, an abuse of the vista leads to dullness and monotony, through the weariness created by sameness of effects. Great beauty provides a thrill which is often enhanced by its unexpectedness, a fact of which we are well aware in nature. Why, then, should not the effects in the plan be conceived with variety, and why are they frequently so stereotyped?

The answer lies in the force of habit, and the too-ready acceptance of what are believed to be Roman canons of planning, namely the cult of the vista, the focal point, and formal symmetry; in a word, the ' grand manner ' brought to such a pitch of competence in the traditional teaching of plan composition along so-called ' Beaux-Arts ' methods.

But the ' grand manner ' represents in reality only one aspect of plan conception. Knowledge of it is indispensable, as an element of technical equipment. The highly skilled and sensitive architect will, however, regard so-called axial planning as representing only one type of technique, with definite but actually quite limited applications, and will not be bemused by the effectiveness of mere paper pattern.

The secret of really fine planning—granted that the preliminary technique of establishing order and sequence has been acquired—lies in the power to *visualise* in the mind's eye, in such a way that they can be actually drawn on paper, the effects desirable and possible. To accomplish this, the architect must have the imagination to create in his own mind the image of his aims; and *he must actually want something*. If his vision sees nothing, he can create only by formula. Vision, the gift of creative design, is not only a matter of temperament; it requires also to be cultivated through exhaustive study and experience. That is one reason why there are few great architects, and fewer still who, having achieved greatness, can maintain their high level of achievement. For few architects have the time, while creating continuously, to store their minds with the fresh fund of experience necessary for the continuity of a high standard of output.

The architect who visualises is able, figuratively speaking, to walk about within his finished building. He does not

at once see all the details; he sees them at first in flashes, and then more steadily as he develops each section of his project. But he has vision clear enough to establish his main effects. He visualises himself as ascending his grand staircase, he sees the balustrade, the walls, the ceiling; and he knows what impression of the vestibule and of the court-yard beyond he will receive when he stands within the threshold of his entrance door.

To understand this attitude towards plan creation, one cannot do better than visit the Town Hall at Stockholm, or at least study in detail, first its plan, and then the photographs of its exterior and interior.

The Town Hall is a building with a plan which is sensitively and finely composed, yet it is entirely unorthodox (Fig. 14). It is full of interesting effects, externally and internally, all developed in an ordered and considered sequence. Yet this building could never have been planned on the routine lines of the ' grand manner,' by the establishment of centre lines and the even balancing of masses to secure a showy plan pattern. The effects of the Town Hall are of such a nature that it is quite evident that they were first desired by the architect, and then visualised in detail. Their sequence was ordered in Ragnar Östberg's mind, each step was clear in his vision. The result is a building full of pleasures, as of course are many other buildings. But here the pleasures are of a hundred different types, and every section has its character and its particular appeal; side by side with powerful effects are byways in which lurk intimate and charming details. Yet the whole is wrought into a wondrous harmony.

Many architects disapprove of the tendencies shown in the architecture of the Town Hall. But nearly everyone

acknowledges the high achievement of its architect in this particular field of expression.

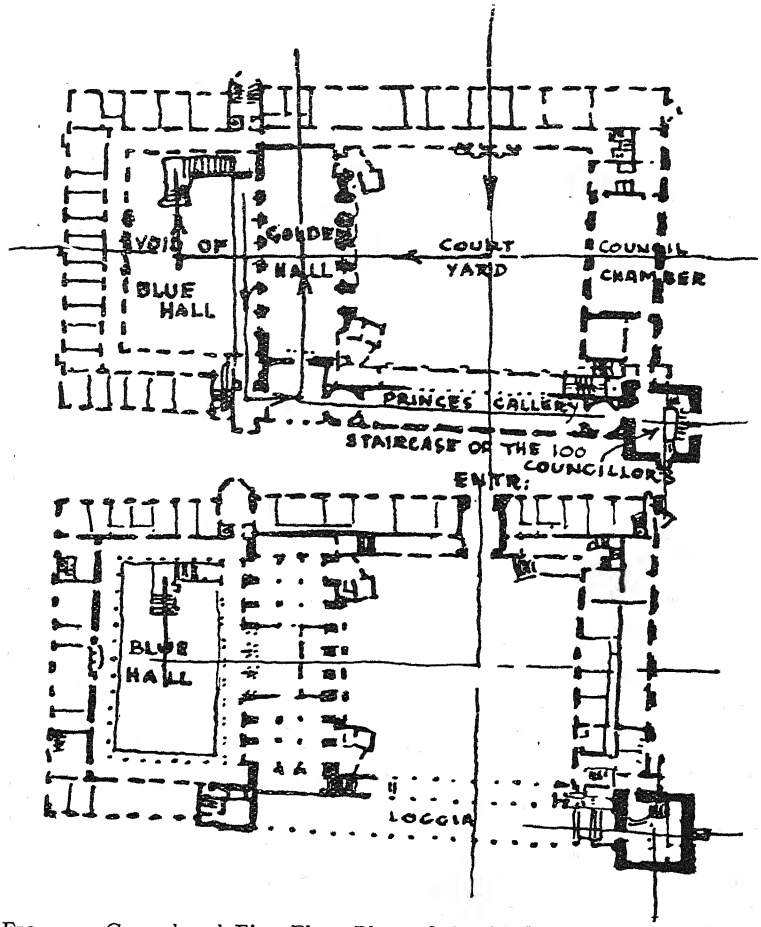

FIG. 14.—Ground and First Floor Plans of the Stockholm Town Hall, by Ragnar Östberg. Unorthodox plans, the effects of which could only have been possible through complete visualisation by the architect.

The type of development which takes place along the established axial lines is obviously dependent upon the

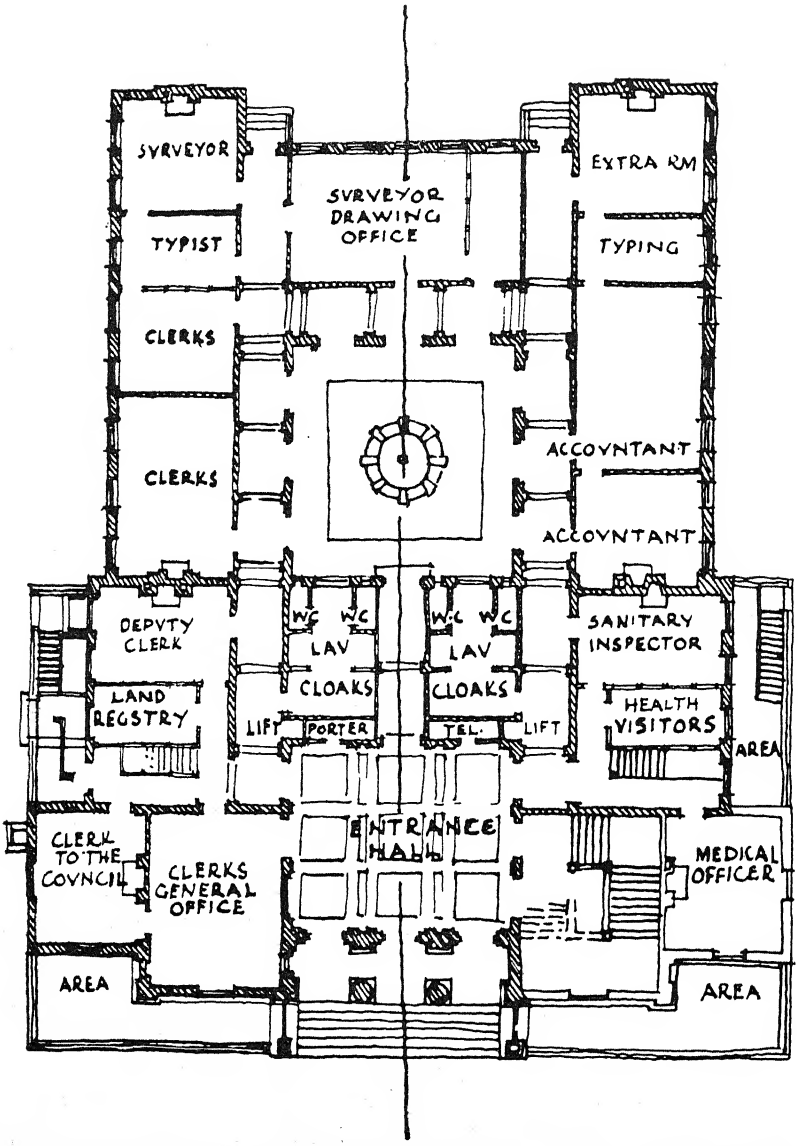

FIG. 15.—A symmetrical plan in which there is no undue stress on complete balance of parts. Nicholls and Hughes, architects.

nature of the particular building problem. But on this point a few general observations can be made.

Any major axis in a plan locates what might be called a 'centre of gravity,' since it is a line of important development. On either side of this axis immediate local developments will probably take place; and, if the axis in question

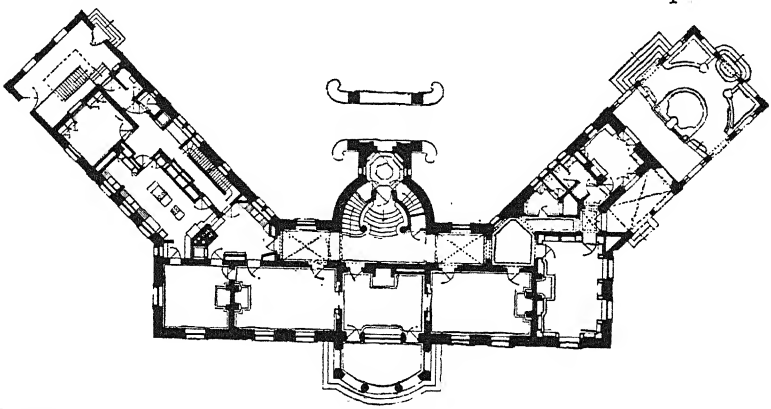

FIG. 16.—A symmetrical house plan with carefully balanced parts, the detail being varied while the general masses correspond. House in Switzerland. Stanley Hall and Easton and Robertson, architects.

is *the* major axis of the plan, it is very apt to prove to be the centre of gravity of the whole composition. On either side of it the remainder of the plan will be established, with the various secondary units having their own major and minor axes.

The types of composition which are built up round the axis as a sort of spinal column to the plan divide themselves into three main groups. The symmetrical, the balanced, and the asymmetrical.

The symmetrical plan is divided into two equal parts by the principal axis, on each side of which elements are disposed in groups which are equal in general mass and

disposition, though not necessarily in complete detail. In such a plan, therefore, there is complete balance, with complete, or almost complete, symmetry of parts (Figs. 15 and 16).

In the balanced plan, the masses on either side of the main axis are equal in weight, but their character and disposition may be considerably varied. On one side may be three large elements, for example, and on the other six small elements. Weighed up against each other, they maintain an equilibrium on the scales, just as three one-ounce weights will balance with six half-ounce weights. Very frequently this type of composition occurs in very large layouts; and a usual arrangement is for the masses immediately adjoining the main axis to be strictly symmetrical, while the more remote elements stray off into individual treatments which only roughly correspond (Fig. 17).

A practical reason for this lies in the fact that the eye can only cover a limited field of vision; and if symmetry can be obtained within this field, the eye is not disturbed by differences which occur beyond its range on either flank. In actual fact, such an arrangement gives interest and vitality to a large composition; for it is not to be expected—or desired—that in a very large plan the elements on either side should be exactly similar, since the effect of this would be to destroy characteristic treatment and invite eye-weariness. The symmetrical centre, however, responds to a natural demand for repose and dignity in the elements forming the nucleus of the composition.

In the asymmetrical plan, the axis is definitely brought to one side of the composition, because the number and type of the elements required by the programme, or the particular nature of the site, suggest a one-sided line of development.

This type of plan, in which there is no main element of repetition, is less dignified than the formal or balanced type, but is more picturesque, and generally more interesting and flexible. It allows of a perfectly free grouping

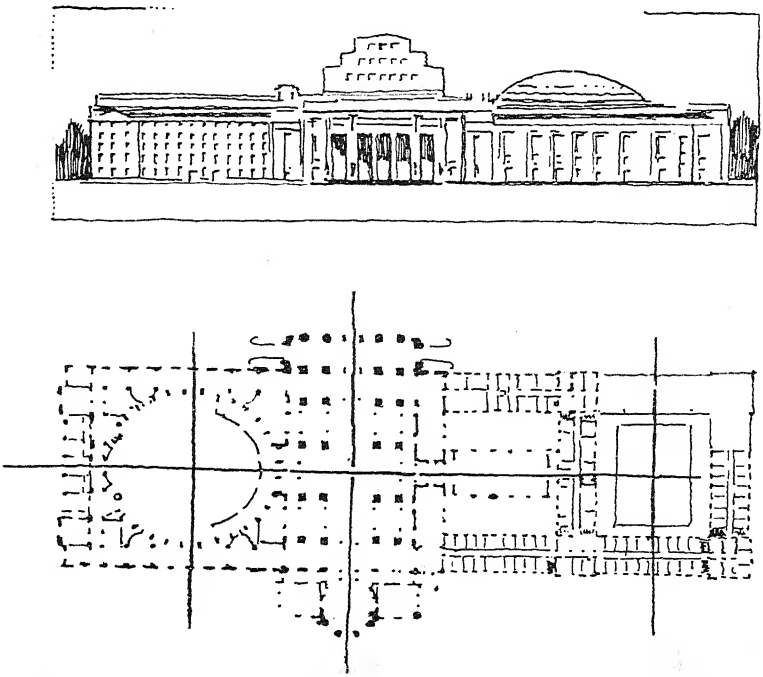

FIG. 17.—A balanced composition, in which the diversity of the lateral elements is disturbing owing to the fact that the central element is too small to dominate. Balanced plans find their best application in large layouts. (Premiated design, League of Nations Competition, by Camille Lefèvre.)

within limits, but is more difficult to compose satisfactorily, as it is not so easy in this case to emphasise the dominant elements and centres of interest. This type is particularly adaptable to small plans, to commercial buildings in which the utmost flexibility and possibilities of extension are a

requisite, and to buildings on sites which in themselves have no element of formality (Fig. 18).

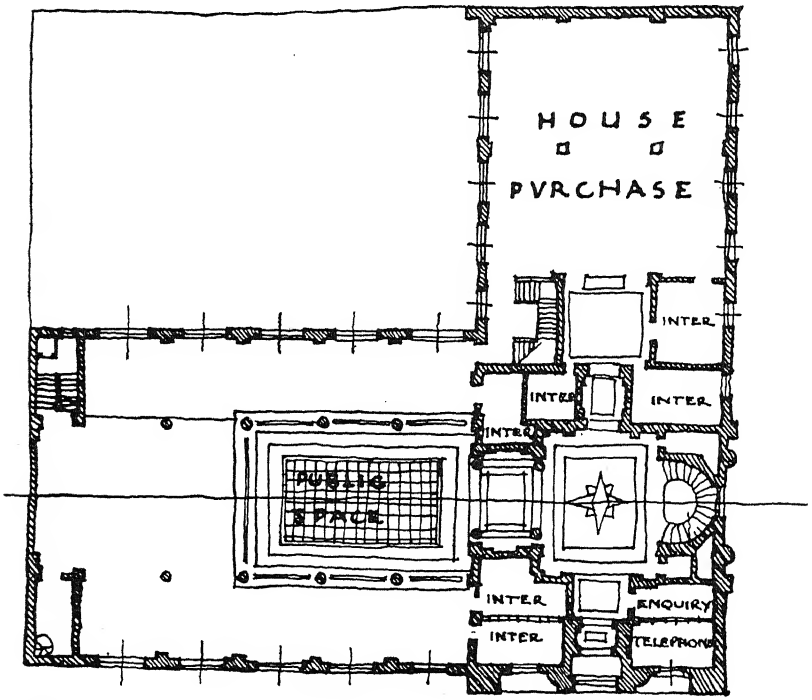

FIG. 18.—Diagram of a scheme submitted in the Birmingham Municipal Bank Competition 1931. An example of a plan of moderate dimensions schemed asymmetrically.

In many types of plan the main axis is accompanied by an important cross axis, which is a line of development at right angles to it. The right-angle crossing is more frequent than that at an obtuse or acute angle, since it lends itself to building formation more practically than any other angle. But angles which are composed of even subdivisions of the right angle, $-60°$, $-30°$, $-45°$, are fairly

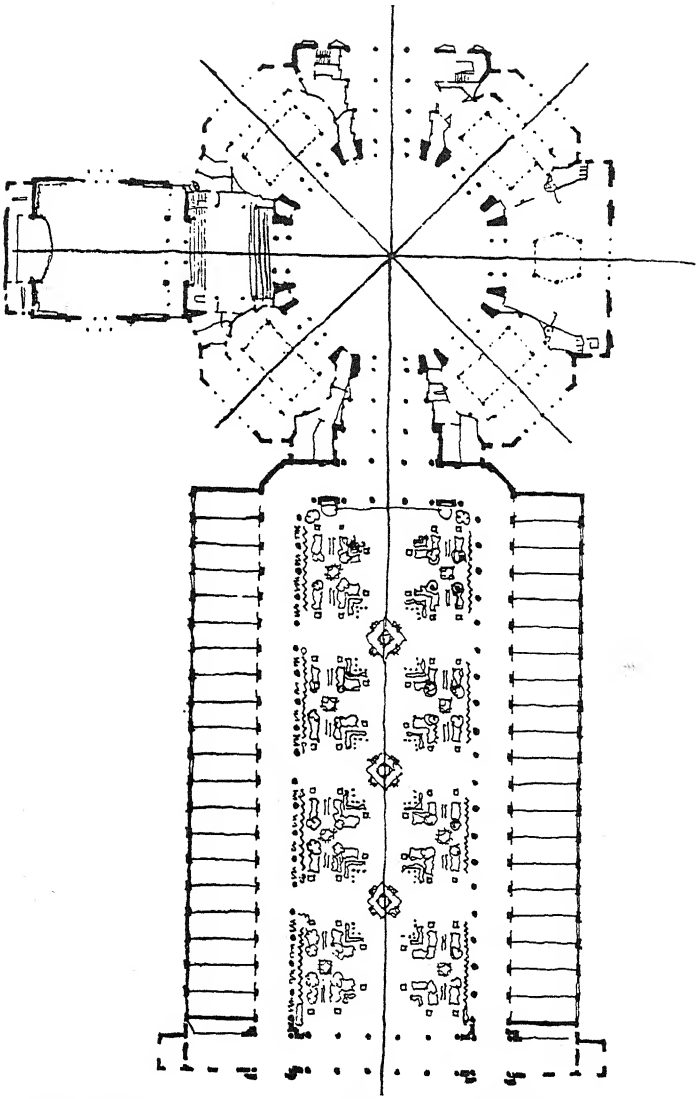

FIG. 19.—Plan of the 'Cité des Informations,' Paris Colonial Exhibition 1931, by Jean Bourgon. An admirable illustration of the radial properties of the octagon as a plan shape.

frequent, since they adapt themselves to regular figures, which again make for easy and practical plan shapes.

Certain figures, such as the circle, octagon and hexagon, lend themselves to the development of a series of axes rhythmically disposed, and on account of their radial property are frequently employed at those junction points of the plan where lines of development cross each other (Fig. 19).

Care is required in planning to ensure that there is no conflict between axes; and it is extremely difficult to achieve an arresting composition without one main line of development being clearly dominant. The presence of the 'dominant' fixes a focal point, and establishes unity, whereas a series of equally competing axes breaks up the composition into a series of individual elements which are not organised under effective leadership.

It is possible, by the stressing of certain elements in the plan, to shift the centre of interest so that compositions change their character, and hence there is a borderline state in which the intention of the designer is uncertain. In this case there is no principal line of development in the scheme; and this may be an unavoidable result of conflicting requirements in the 'programme.' Even in such a case, it is often preferable to create a dominant even at the expense of strict logic, just as in human affairs a leader is necessary in spite of all theories of equality.

The principle of the division of plan types into groups applies equally to the individual elements of the plan. A room, for instance, may be symmetrical, balanced, or asymmetrical, *i.e.* formal or informal. Even in a room it is possible to trace the axis and dispose the 'weights' around the centre of development, which in the case of symmetry and balance is a centre of gravity (Fig. 20). To plan in this

way is to introduce the element of organisation, which is precisely the aim of the modern architect. The effect is the production of order, the plan is 'tidied up,' so that even the humble fittings of a bathroom or kitchen may be set out in architectural order and harmony.

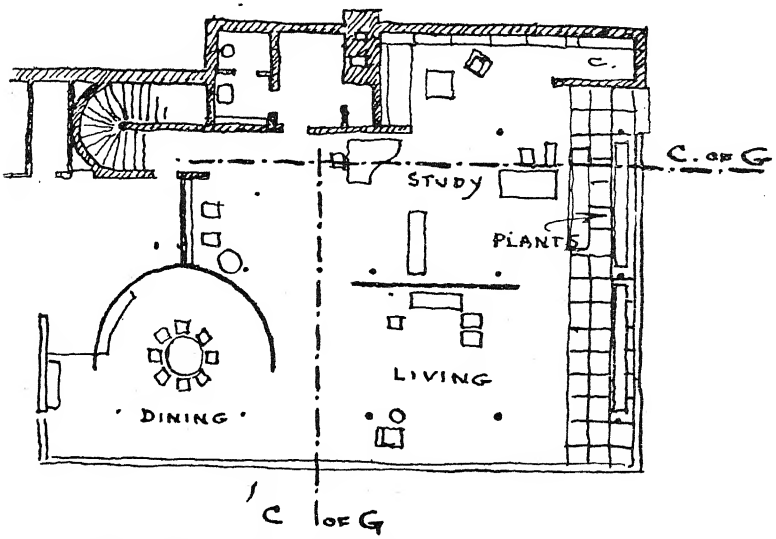

FIG. 20.—Room spaces of generally informal character, but with a general balance of parts. Centres of gravity have been suggested. (Villa in Czecho-Slovakia, by Mies van der Rohe.)

One failure of architects in the immediate past has lain in neglect of logic and of architectural composition in dealing with the more humble units of the plan. In the old-fashioned bathroom, for example, the bath was frequently placed directly under the window, the basin mirror was so arranged that one's back was to the light, the floor space was most restricted alongside the bath; the towel rail (if any) was out of reach, the electric light for the basin was placed where it shone on the back of the neck, leaving face and hair

in shadow. The modern architect, on the other hand, takes the bathroom problem as seriously as any other. In fact, he examines all the functions of each room, however humble, in logical sequence, placing all his elements so that they perform their service properly. Having located them correctly, he proceeds to the niceties of adjustment, the give-and-take which in architectural parlance is part of 'study.' Finally, each element is practically and harmoniously disposed. The result is order, clarity, convenience, æsthetic satisfaction, and the possibility of applying to each room almost any type of decoration with the absolute certainty that, however bungled the detail, the essential rightness in the composition will save it from disaster.

Another example of modern efficiency in the minor details of planning occurs in the present-day satisfactory treatment of kitchen and service quarters generally. Kitchen equipment is nowadays splendidly designed for practical service, and the architect of the modern school disposes it with the same care and delight in smooth arrangement as he uses in planning a large group of buildings. The sequence of kitchen processes, food arrival, preparation, cooking, dishing-up, service, washing, disposal of utensils, is the subject of analysis in order to arrange for the proper placing of the elements. And these elements are themselves unified in an ensemble of smooth lines, incorporated in the structure where possible, and arranged so economically and thoughtfully that even in cramped dimensions there is a reserve of free space for the emergencies of service (Fig. 21).

The creation of a sense of ample space, over and above the minimum demanded by physical requirements, is an achievement brought about through the modern outlook on design. In the same way as in the modern kitchen and

pantry ample shelves offer space for work, and for the disposal of utensils at every useful point, so in the living-room or bedroom continuous table tops or ledges along the wall offer accommodation for books, papers, *objets d'art*, lamps, flowers,

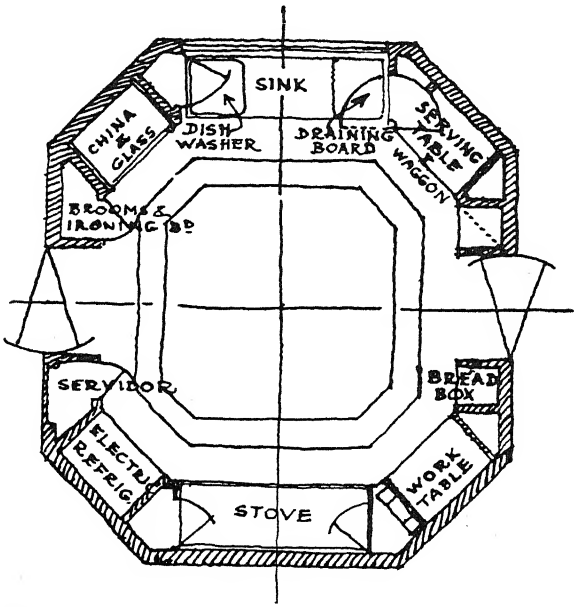

FIG. 21.—Plan for an octagonal modern kitchen, with maximum compactness and minimum space to be traversed, by Donald Deskey.

to be disposed as the mood of the moment may dictate (Fig. 28, page 69). With this system, as opposed to the isolated table top or what-not, dozens of changes may be made in the arrangement of the objects which make the home personal and livable; and there arises a comforting feeling of amplitude, a sense of being at liberty to dispose with spacious ease one's belongings and household gods. Behind this idea of freedom in selection lies the same instinct which causes

the business man to demand an immensely broad and unobstructed flat-topped desk, in the centre of which is his working space, while to right and left and in front are his papers and works of reference. Those who recall the office in the film 'Metropolis,' with its great curved working table, will remember the sense of liberty and amplitude which this particular 'set' conveyed in the character of its design, every detail of which suggested a wholly modern efficiency.

Space, order, carefully calculated arrangement of main surfaces, smooth disposition of the accessories of service and equipment, and an impression of hygiene and mechanical efficiency, are attributes of the truly modern plan, but freedom and fancy in detail are by no means to be eschewed for that reason. The major effects are intellectual, even severe; they are obtained by careful processes of logical thought. Then, as a contrast, human liberty and fancy may intervene, the more potent in effect because of the restrained quality of their background of structural form.

II

The Structure

Some theorists contend that the basis of architecture is structure. But this thesis is erroneous, in so much as the development of structure follows the demands of the programme, itself the expression of formulated needs. No man bothers to construct without the promptings of a need, and he who builds attempts to evolve a type of structure which will serve the programme as efficiently as possible. If he be incapable of devising a structural system which will enable him to build what he desires, he perforce limits his desires to conform to the structural restriction.

Great architecture may arise as the result, because, within its limitations, the structural system, and its æsthetic expression, may appear as perfected as is humanly possible. It would be unprogressive to remain content with this perfection, however, if the day dawned when a new structural system, which could better satisfy the original requirements, became available. The proper course would be to take advantage of these new structural possibilities, and to put up with the possible imperfections of æsthetic expression inseparable from the adoption of new systems, secure in the certainty that later, when the proper experience and technique had been given time to develop, this expression would gradually attain to higher standards.

The history of architectural development, if we examine it in a spirit divorced from preoccupation with names and

dates, reveals a sequence of phases in which the possibilities and limitations of structure have played a dominating rôle. It discloses the origin, growth, maturity, and decay of various structural systems, and reveals the experiments and failures which accompany the change-over from an outworn system to the new system which is going to supplant it either temporarily or permanently.

Equally clearly, history shows the tentative experiment, the crude imperfection, of the architectural expression which arises at the commencement of each and every new phase. It shows how, in cases where the structural system is sufficiently sound to achieve a relative permanence, architectural expression slowly improves as the general technique develops. And it also shows how, when the structural system is beginning to be out of date, architectural expression is apt to languish, or else runs riot in a desperate effort to achieve fresh significance without having any organic basis for development.

The Egyptian structural system is the first of which we have sufficient records and information to merit serious consideration. Little trace remains to-day of Egyptian domestic work, or of temporary buildings in general. But there are plenty of examples of more ambitious buildings, which reveal a certain structural technique.

The Egyptian system is based on the principle of the beam and its supporting column, the simplest type of engineering construction if we except the process of hollowing out the natural rock. We find, in the rock-cut temples, the combination of the natural monolithic structure and the artificial post and lintel. We find, too, the vault in embryo, though the Egyptian seems to have regarded arched surfaces as more practicable of realisation by a series of superimposed

corbels, that is to say cantilevered lintels, than by voussoirs exerting lateral thrust. The virtues of Egyptian architecture, structurally considered, lie chiefly in a solid exposition of the post and lintel principle, with a large margin of safety and structural detail somewhat shoddy at times, but redeemed by the strength and permanence of sheer bulk.

In Greece the structural system of post and lintel was continued, but with far greater refinement as regards structural technique, and also with a far greater beauty in architectural expression. After all, the post and lintel system had been in vogue for several centuries; it was not surprising that in a country with the high cultural standards of Greece it should achieve a state of something approaching perfection.

But, in itself, this system remained primitive. If the problem of building is fundamentally that of enclosing or covering space, the Greek system did not contribute much to its solution. Greek plans were limited in span, points of support were so numerous that nowadays they would be considered as an intolerable encumbrance, and a vast amount of workmanship was involved in erecting the complicated stone entablature which embodied in its design both wooden origins and a replica in miniature, in the shape of tryglyphs and cornice, of the system of column and architrave below.

A certain amount of structural organisation is revealed in the plans of early Greek buildings. For instance, the antæ were strong corner posts which took a main load and strengthened the angles of the structure, so that lighter walls of earth and plaster could be built between; and this was an early recognition of the economic structural possibilities of the loaded column and the light screen wall. But, on the whole, with their apparent neglect of the

possibilities of vaulting—the principle of which was certainly familiar—the Greeks did not store up a very rich structural treasure.

What Greek architecture did achieve was a wonderfully perfect expression of a very simple structural system. The Greeks concentrated on one thing, and brought it to a pitch of sensitive refinement never before equalled, and seldom approached since. But the apparent willingness of the Greeks to accept limitations of this structural idea places Greek architecture in a class by itself; and what its study can chiefly give us is a clue to the essence of beauty, and practical guidance on the road towards perfect expression. But only in the abstract sense; for we cannot recapture the Greek spirit by stealing Greek columns and running steel stanchions through their heart.

In Greek work, with one or two unimportant exceptions, the beam or lintel was *straight*. The structure is that of post and straight lintel. In the next great structural period, however, that of Roman architecture, a new system of construction was invented, which, for the sake of contrast, might be called the system of the *curved* lintel.

The great achievement of Roman structure was that of covering great spans. The Pantheon, as we know, is covered by a single dome, without any intermediate supports, which is over 150 feet in diameter.

The Greeks, with all their perfection of form, never achieved anything so ambitious.

The key to success in these structural feats lay in two factors. One was the use of the famous concrete, to utilise which the Romans had both the materials and the technique, and the other was the adaptation to this material of a system of structural ribs and infillings. The system of this

infilling was based, like that of early Egyptian arched forms, on the principle of corbelling, bearing on ribs of tile and concrete. Each layer extended beyond the one below, bearing directly upon it, and was stabilised laterally by a system of transverse and lateral ribs. This method, therefore, practically provided its own centering, and as the vault mounted towards its summit each layer became part of a homogeneous whole, which, when completed, sat like an inverted saucer upon its walls. The system, therefore, is that of a lintel built up in layers, constantly extending upwards and inwards, till the crown is completed. The principle of arch, with thrust and counter thrust, is not fundamentally involved. The structural system is, in fact, that of the curved lintel.

The dead weight of the loads from such a roof demanded great thickness of wall as a support. And here again Roman constructors were resourceful. For they explored the possibility of building this wall in two skins, linked together at intervals by membranes in the shape of walls with arched openings permitting a channel of circulation between the outer and inner skin. Not only did this arrangement lighten the structure, and effect economies in foundations and walling material, but it also provided additional space and a thermal and weather insulation for the building on the principle of the hollow wall.

Roman structural design marked, therefore, a definite advance in technique. It dominated the architectural conceptions of the period during which the Roman Empire exerted its world influence (Fig. 22).

Continuing this process of analysis, we find the next great period of structural invention in what is called Gothic or Mediæval architecture. And here development is marked

by the introduction of an entirely different principle, that of the Gothic vault.

The characteristic of Gothic architecture is not the pointed arch, but the system of covering space by means of

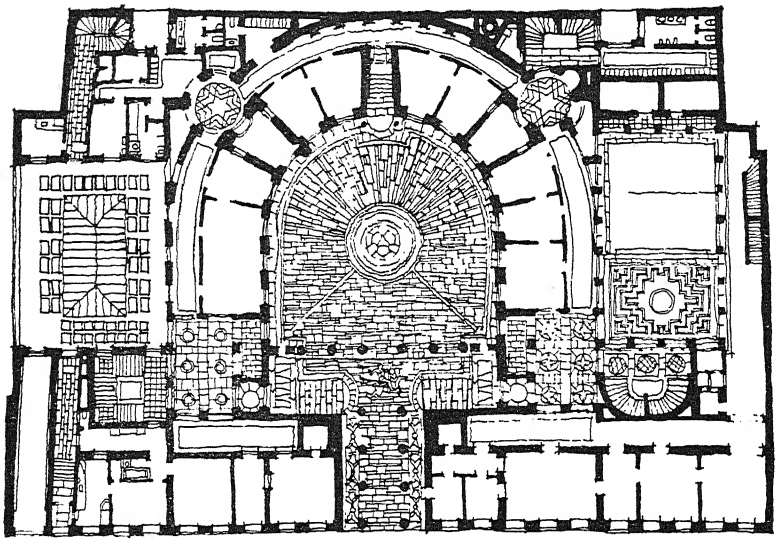

FIG. 22.—Roman methods of construction, with massive walls, gave rise to plan forms in which shapes were ' hollowed out ' of mass. Many modern plans reflect Roman forms, *e.g.* the offices of the Swedish Match Company in Stockholm, by Ivar Tengbom.

vaulting formed of a light masonry infilling which maintains itself by the pressure of its thrust on a system of masonry ribs. These ribs are themselves in equilibrium, because they are formed by splayed voussoirs, and these voussoirs, thrusting one upon the other, transmit the load of both the infilling and themselves to the ground. This transmission is effected through stone pillars, which are prevented from being thrust outwards towards collapse by the buttressing

of either lateral structures, specially constructed and loaded buttresses, or a combination of both. Laterally, the pillars and buttresses are linked together by arches and walls which act as a brace, making all the column and buttress units interdependent and mutually supporting. The space between these columns and buttresses may then be left void, or filled in with light screens of masonry or masonry and glass.

Here, then, described in bald terms, is the Gothic structural system, evolved to cover and enclose space.

It is an ingenious and daring system, dependent for complete success upon a thorough knowledge of engineering principles and their application to masonry practice. Mediæval designers were not, however, equipped with a science on a par with their flights of imaginative daring, with the result that many collapses of vaulted Gothic structures are said to have occurred.

In any case, this structural system was far from perfect. Such an interplay of stresses, actions, and reactions demands either a large margin of safety or very dependable materials. And, in addition, although the system of isolated points of support and light screen walls permitted wide spans and unobstructed floor space, the necessity for buttressing raised great practical objections, for not only did the buttresses occupy valuable ground space, but they furnished only untidy and rather amateurish solutions towards the problem of providing stability. The fact that they have been marvellously treated as structural and decorative elements, and clothe the exteriors of the great cathedrals in a garment of mysterious and complicated form, does not remove the impression that dependence upon the buttress was a definitely limiting factor in the possibilities of the Mediæval structural system.

Out of Mediæval structural experience there emerges, however, one valuable suggestion, which is that of the potentialities of skeleton framing. The whole system is that of the skeleton frame plus an infilling; the roof sections happen to be curved, and the skeleton is in masonry. But the germ of an idea is there; and we shall later see it re-appearing as a principle of modern structure (Fig. 23).

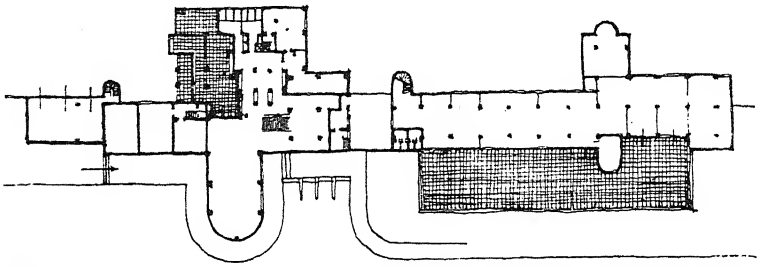

FIG. 23.—The principle of a skeleton framework, evolved in mediaeval architecture, becomes typical of modern structure. This plan by H. Th. Wijdeveld, for an International Guild in the Netherlands, has a Gothic freedom in form and structure.

The next great period is that of the Renaissance. But in the matter of structure it was not epoch making, except for a few brilliant feats which, occurring in the early stages of the movement, undoubtedly contributed very greatly to establish its prestige and sway over architectural development.

Architectural historians devote many pages to the thrilling episodes which led up to the final completion of the dome of Florence Cathedral according to the plans of Brunelleschi. Considering the difficulties, the construction of the dome was a marvellous accomplishment, and revealed a thorough grasp of engineering principles. For the silhouette of the dome and the placing of the lantern are both excellent pieces of design, the one minimising thrust through its curvature, the other preventing the lifting of the crown

which in a ribbed dome of this type might conceivably occur. Another great historical episode is that of the building of the dome of St. Peter's, pointing the way to dome-solutions of a very practical and flexible type, like that of Wren's dome on St. Paul's, and—much later—Soufflot's dome over the Pantheon in Paris, both of which are erected on the principle of an inner and outer core, the latter taking its bearing upon the former.

In spite of these achievements, however, the Renaissance, in structure as in architectural design generally, was in the main a period of variation and improvement upon past performance. It contributed no entirely new or characteristic system. It was essentially a period of the summing up of the past, of a thorough understanding of scholarship, and as such it reached a stage of high development, only to stagnate later through the failure of structural invention to provide new avenues for architectural expression. Hence the gradual decline, the flowering of the Baroque in a desperate effort to revitalise the lethargic spirit of the antique tradition; and, finally, the feverish series of later revivals, in which the architect pinned his faith to nearly every great period, one after the other, finding himself faced always with a *cul de sac*. For the revivals had no real basis. They were directed towards a return to past styles, the foundations of which were outworn structural systems. It was absurd to hope that either the style could be adopted without the system or that, if both were followed *in toto*, they would provide effective solutions to problems which were beginning to develop on lines without precedent in antiquity.

The new building problems which arose with the dawn of the nineteenth century industrial era called for new structural

facilities. These were met by the production of cast iron for building purposes ; and later, as we know, by the introduction of rolled steel and its structural application in the steel frame building.

The development of cast iron and steel in buildings can be followed in structures such as Paxton's Crystal Palace, the Galérie des Machines in Paris, and in the use of iron columns and cupolas in Labrouste's Bibliothèque de Ste. Géneviève in Paris. The history of the steel frame building is most admirably given in Colonel Starett's book *Skyscrapers and the Men who Built Them*, and in addition the author discusses in complete detail every aspect of modern steel construction as applied to tall buildings.

At any rate, here was the steel frame, an entirely new structural system, its only parentage—and that remote—being the Gothic framework of masonry. It is not too much to expect that this great addition to the resources of building technique should have its reactions on architectural design, and that the architect, released from any but the widest limitations in his desire to bridge and enclose space, should find in his newly-found liberty sources of inspiration sufficient to place the twentieth century on at least as high a plane as that reached by any of the great structural periods of the past.

The architect of to-day has to design in terms of this structural invention, which he must either master or risk that it become a Frankenstein to threaten his very existence; for the steel frame, or any structural system of that type, is so much an integral factor in design that it is apt to govern the essential features of the building's conception, just as did the Gothic framework.

Having a bearing on the rôle of the architect, and on the

future of architectural development, there is another important factor to be taken into account. This is the present-day status of engineering as an exact science, as opposed to the method of empirical calculations and rule of thumb which obtained in the past.

The scientific attitude towards structure, and consequently towards architecture, is a predominant factor in what is called 'modernism'; in the birth of this attitude, which has been already touched upon in its application to the plan problem, lies the root, and the strength, of real modernity. All important structure to-day is exactly calculated, on the basis of ascertainable facts, with certain established margins for contingencies. And never before in the history of architecture have science and æsthetics been so intimately connected.

Science is to-day governing structure; and consideration of structure is an integral part of design in nearly every aspect. The architect must therefore be familiar with structural possibilities if he is to fulfil what should be one of his most important rôles, namely that of the creative artist whose skill finds an answer to every problem, even when it has never been previously stated in exactly similar terms.

Obviously, the contact between the architect and the technical science of structure must be very close. The architect should be at least alive to all the possibilities of structure in its present stage of development; and he must be sufficiently aware of the trend of progress to judge of the directions in which it may develop to-morrow. This suggests, at first sight, the training of the architect in part as an engineer. And many architects, had they the opportunity to recommence their architectural careers on the basis of present experience, would doubtless devote a larger section

of it to the study of engineering practice. But not wholly in an engineering school; for the most valuable engineering experience for the architectural student would be found in contact with the practising structural engineer engaged on architectural problems.

It would be unwise, however, for the average architect to attempt to practise the structural engineering of his designs; for too close contact with the letter of fact is apt to restrict the imagination. There is a gibe that the specialist is always apt to diagnose the disease in which he specialises—one remembers the nuciform sac of ' The Doctor's Dilemma '—and there is no doubt that too much knowledge of the major and minor technical difficulties to be surmounted often provides a series of plausible reasons for rejecting original solutions and breaking fresh ground.

Nevertheless, the architect's office of the future will almost certainly be increasingly preoccupied with the engineering side of design. And, probably, the future of architectural practice will lie in amalgamations, in big offices with several partners, a pool of assistants, and, as part of the organisation, a combined engineering and mechanical equipment specialist. For the busy architect can seldom undertake engineering successfully on his own account. Nor will the average engineer become a successful architect; for the engineer who believes that architectural design is principally a matter of structure is ignorant of what an architect's practice involves.

In dealing with structure, as with the plan arrangement, the need for *organisation* is apparent. For structure, originally the method of building the framework to support the elements of space enclosure, is becoming ever more closely linked with mechanical equipment. The organs of structure

may, quite feasibly, be combined with the elements for the service of the building. An elementary instance of this occurs in the employment of the casing of a stanchion as a lighting, heating and ventilating unit. The use of waste heat and steam, the possibilities for electrical supply in conjunction with heating plant, are also matters which nowadays are to be considered. Services of different categories must be arranged where possible to serve each other's needs. Already the importance of their convenient arrangement impinges on the layout of actual structure; in the future it may do so still further, and it is probable that structural and mechanical equipment engineers will be merged into a single unified profession to deal with combined elements of structure and service.

The architect must keep abreast of all these developments, and also realise that because steel and concrete frames are in current use to-day, structural possibilities do not end with them. Impatience with the limitations of structure, or rather with stereotyped methods of designing structure, has been felt by many architects. And a few, through the force of their skill and courage, have broken through the ring with great gain to freedom of plan, design and expression.

In factory work, to take an instance, it was formerly the custom to place stanchions as part of the external walls of buildings, where they projected internally from the wall surface and dictated the location of windows, in addition to obstructing light and work. In many buildings of this class, however, an absolutely continuous window line, and the absence of internal projections, has been found desirable, with the consequence that there has been developed the system of placing the stanchions internally, and cantilevering out the floor to the outside wall (Fig. 24). Not only is

this type of construction frequently employed in factories, but it is in use in shops and other types of building, even—in the hands of Le Corbusier and Jeanneret—in domestic work.

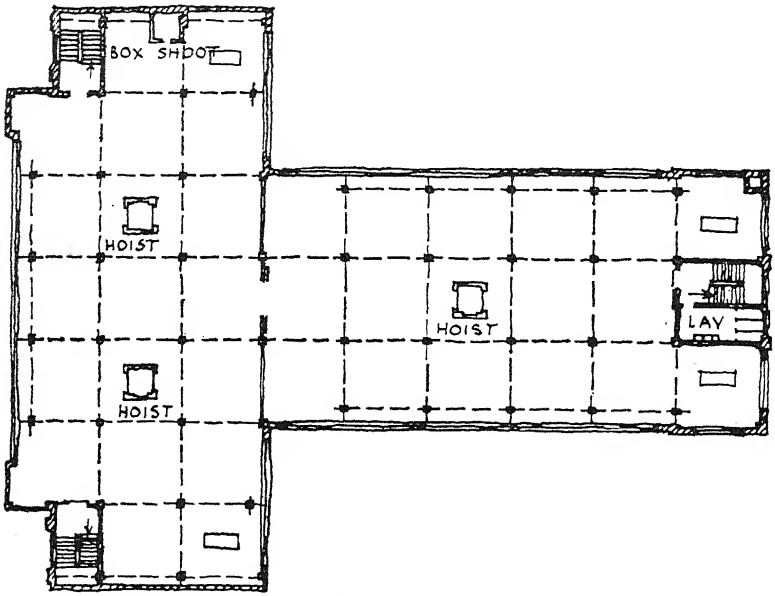

FIG. 24.—Typical upper floor plan of a factory at Salford, by W. A. Johnson, in which the structural supports are maintained within the enclosure of the walls.

This structural system permits what Le Corbusier calls *la façade libre*, and also *le plan libre*. The basis of the idea is that walls are no longer used as support, but solely as elements enclosing space. The structure of the building consists merely of posts, and of floor slabs which oversail the outermost line of posts in every direction, as a cantilevered slab. As a result, external walls become merely light screens between floors, and windows may become continuous from end to end of the façade. Internal partitions and staircases are merely so many units which rest upon the

slab. Walls need not be carried up; they have no bearing upon each other, and in consequence they can be as light

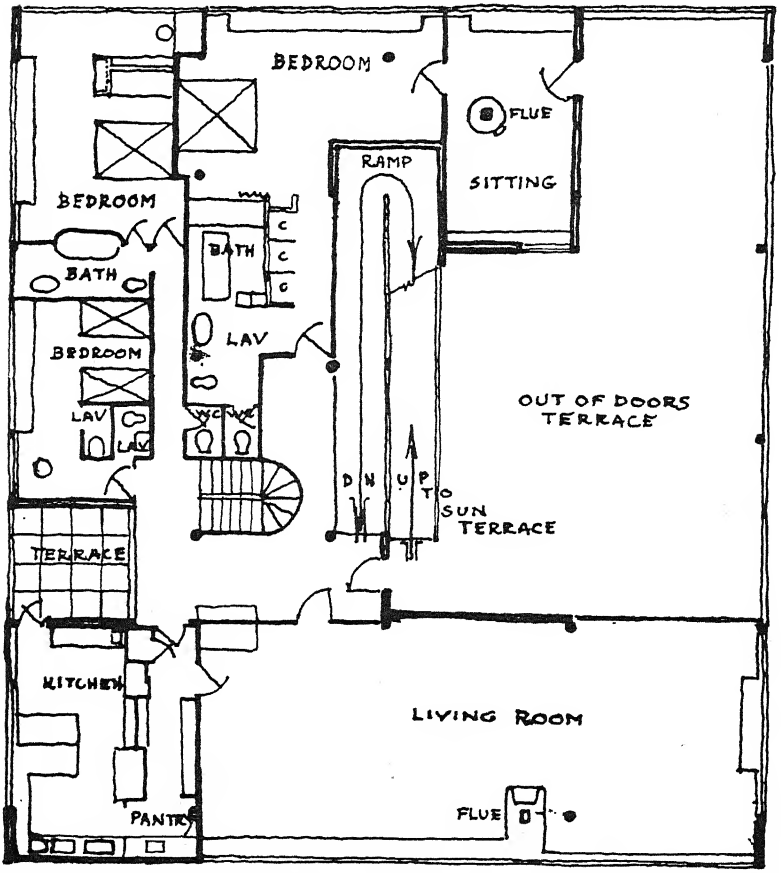

FIG. 25.—Main floor plan (upper ground) of a house at Poissy by Le Corbusier and Jeanneret. Structural supports are established at suitable intervals, and partitions and wall openings are freely established, being supported on the floor slab.

and thin as the requirements of science in the matter of strength and non-conductivity can permit (Fig. 25).

A further consequence is that there is no longer need for walls at ground floor level; if the owner desires, the ground floor as such need not exist, but can be treated as open space or else utilised for garage, storage, etc. The house, carried on its posts, may become a house on stilts.

The structural posts are, of course, frankly accepted, and pass up through the rooms wherever they naturally occur. Since there are no heavy and continuous walls, chimney flues are carried up as independent pipes; for the plan arrangement may not make it convenient to arrange for superimposed walls in which the flues may be incorporated. Chimney and flue are supported on the floor slab, and the fireplace may occur, like a piece of furniture, at any point of the floor space desired, and not only against a wall. The practical advantage here is that there is more room round the fireplace, that it can be kept well away from doors and draughts, and that the chimney acts as an additional heating surface and does not waste its heat on an adjoining room or corridor, or, *a fortiori*, on an external wall.

Le Corbusier and Jeanneret's house at Garches has its structural system in reinforced concrete, and its stanchions and floor slabs are so calculated and spaced that no beams are visible, which is a great advantage from a decorative point of view.

Reinforced concrete is used on the Continent, in this country, and in parts of the United States, on much the same structural lines as the steel frame. But every material seems to develop sooner or later its own structural layout, peculiar to its special properties, and we have not in all probability arrived to-day at the best structural solution for buildings in this material. It has very special possibilities in the matter of economy, and also as regards an altogether new outlook on the formation of structure.

An instance of the type of development which is taking place in concrete occurs in the previously mentioned Dorchester Hotel in Park Lane, where the entire structure is of reinforced concrete. In this building the whole of the upper structure is carried upon a deep raft occurring over the ground floor, and this is in turn carried on a few very large and widely-spaced piers, so that the ground floor and basement present a maximum of free and unobstructed space.

The supports of the upper floors are constituted by reinforced slabs of wall, which run up vertically through the building, and there are no individual stanchions. The outer walls are themselves reduced to about 8″, and are formed of reinforced concrete poured between an inner skin of cork and an outer skin of special slabs of concrete faced with terrazzo.

The whole scheme, structurally considered, is typical of a special material, and its adoption proves the possibility of a departure from the type of skeleton frame construction which is habitual in the steel frame building.

The system of construction employed at the Dorchester Hotel contains that element of 'continuity' which Frank Lloyd Wright has for long envisaged. He has aimed at the elimination of post and beam in favour of the slab, in order that walls, floors and ceilings might merge together in an unbroken unity.

The slab, and its combination with the cantilever, is the solution at which Wright arrived in the construction of his Imperial Hotel at Tokio. This construction was one of the features which ensured the life of the building in the Tokio earthquake, and seems to show that æsthetic properties in the cantilever system go hand-in-hand with economic structural stability.

A number of architects and builders have previously pioneered in concrete in a very interesting way, notably the Perret Brothers in Paris, who combine the function of architects and builders. Their concrete churches at Le Raincy and Montmagny are particularly stimulating from the structural standpoint, and no doubt inspired to a certain degree the Swiss architect Karl Moser in his concrete church of St. Antoine at Bâle (Figs. 37, page 91, and 104, page 215).

The outstanding characteristic in all three examples is the lightness of the construction; and the Perret Brothers are undoubtedly correct in believing that the employment of concrete in heavy masses is not a step in the right direction. The large cast concrete windows of these churches are particularly interesting, and suggest possibilities in precast wall and window units adaptable perhaps to commercial buildings. For the moulding process lends itself to repetition, and the lightness of the construction effects economies both in space and material.

Judging by the types of work which have been executed in concrete, it seems likely that there are two directions in which development may take place.

In the first, where concrete is reinforced, the structure and the design are indissolubly blended; that is the case in the three churches mentioned, and in all the other work of the Perret Brothers. It is the case also in the Centennial Hall at Breslau by Max Berg, in the Klavniko Palace erected for the Brünn Exhibition (Czecho-Slovakia) in 1928 to the plans of Josef Kalous, in the Orly Airship hangars by the French engineer Freyssinet (1922-3), and in other buildings of similar scope. The use of reinforced concrete seems to be particularly adapted to the covering of

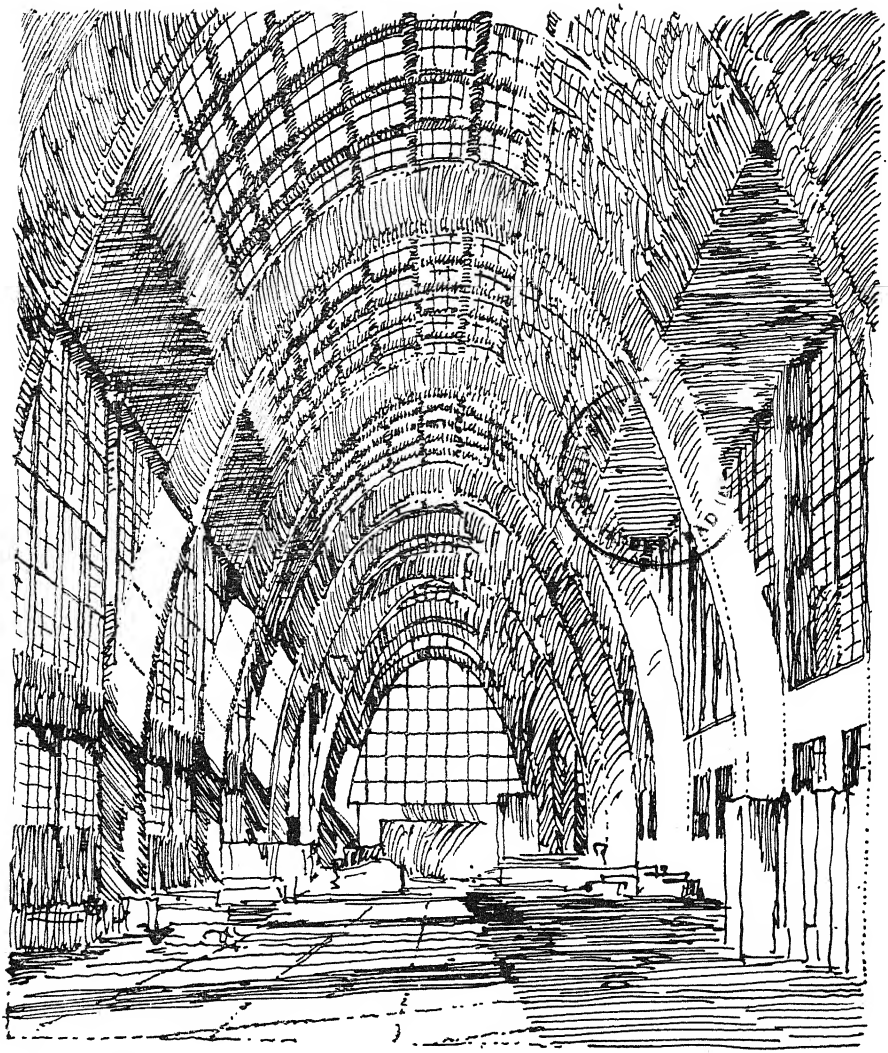

FIG. 26.—The interior of the Klavniko Palace by Josef Kalous at the Brünn Exhibition (1928).

large spaces, and the forms of all these latter buildings show concrete as a plastic structural element, the use of which is not restricted to layouts based upon a rectangular and rigid geometrical pattern (Figs. 26 and 27).

In certain other examples of this category, such as the Market Hall at Frankfurt by Professor Elsässer, and the

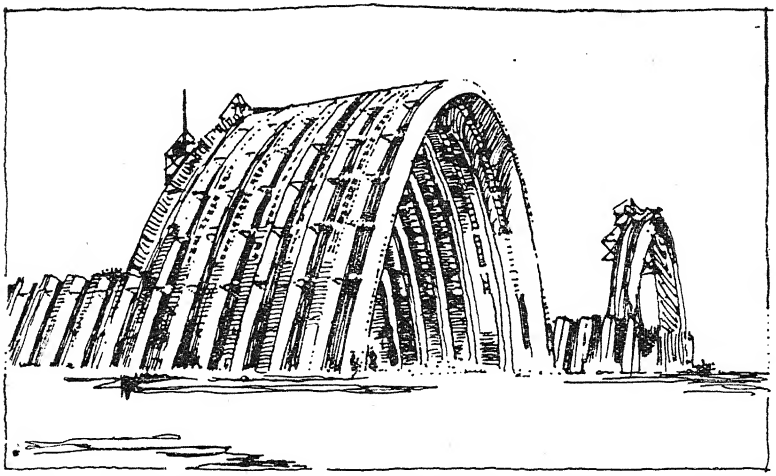

FIG. 27.—The concrete airship hangars at Orly, by Freyssinet, in course of erection.

Royal Horticultural Hall, London, by Easton & Robertson, concrete is the basis of the structural system, but it is combined with other structural materials. All these buildings can, however, be classified in the same general category as regards their structural basis (Figs. 29 and 30).

The second, and much less important category, is characterised by the use of concrete as a block, treated more or less in the manner of real or artificial masonry.

Frank Lloyd Wright, in an article on concrete in the *Architectural Record*, has said that ' æsthetically concrete has neither song nor story,' and points out that it is a con-

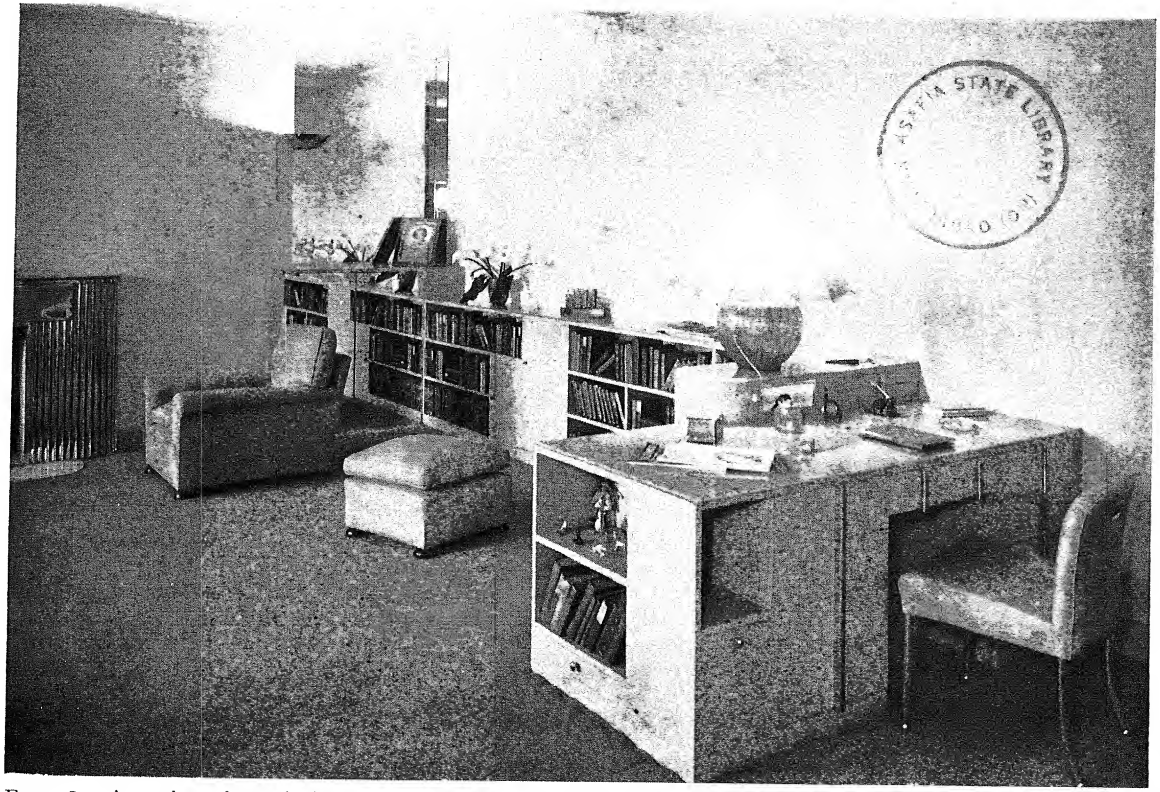

FIG. 28.—A modern domestic interior in which a sense of space and freedom has been created. Stanley Hall and Easton and Robertson, architects.

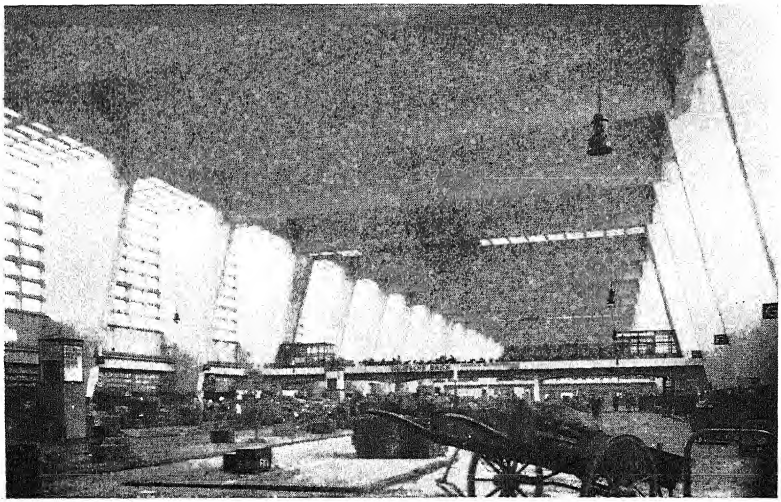

FIG. 29.—The reinforced concrete structure of the Frankfurt Market Hall, by Professor Elsässer.

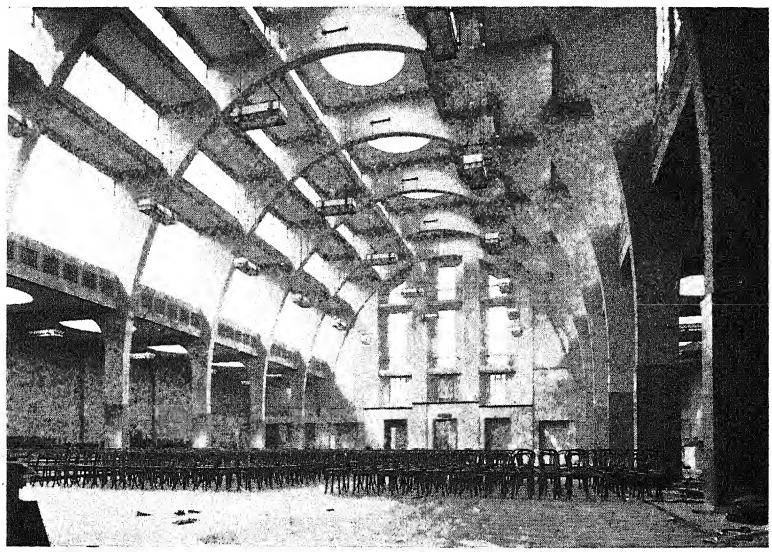

FIG. 30.—The reinforced concrete structure of the Hall of the Royal Horticultural Society, London, by J. Murray Easton and Howard Robertson.

glomerate mixture which has little quality in itself. 'If this material is to have either form, texture, or colour in itself, each must artificially be given to it, by human imagination.'

The form of concrete, as Frank Lloyd Wright points out, is a matter of the process of casting, and he goes on to summarise its properties as follows: (1) It is a mass material, (2) it is impressionable as to surface, (3) it may be continuous or monolithic within certain very wide limits, (4) it may be chemicalised, coloured, or rendered impervious to water; it may be dyed or textured in the stuff, (5) it is a willing material while fresh, fragile when still young, stubborn when old, lacking always in tensile strength.

The architect who is attempting to perfect his technique in concrete design may well ponder upon these five points, and may possibly come to the same conclusions as Frank Lloyd Wright, who asks—and answers—the question, 'What should be the æsthetic of concrete?

'Is it stone? Yes and No.

'Is it Plaster? Yes and No.

'Is it brick? Yes and No.

'Is it Cast Iron? Yes and No.

... Thus concrete becomes the ideal makeshift of this, the vain-glorious Makeshift-Era.'

The fact that concrete can be patterned or embossed while fresh and wet, and that it can assume the imprint of the character of other materials upon its face, opens up vistas of possibilities and also of temptations. Dr. Oscar Faber, in the Bank of England, has secured very pleasant texture upon poured concrete by lining his forms with milled rubber sheeting; Frank Lloyd Wright has built beautiful walls of concrete blocks, alternating schemes of patterned and plain surfaces. The scope appears to be

vast, the technique something to be formed in an entirely modern way (Fig. 31).

But one important aspect of the use of concrete is this : It brings design and structure into closer relationship than does any other material; and any great increase in its popularity will bring the architect and engineer into increasingly close contact. Yet each will still maintain his entity, for the use of concrete will by no means reduce the task of either partner in solving problems which will more than continue to keep pace with scientific and æsthetic developments.

Systems for providing a framework for buildings are certainly available in many forms, all of which are practical and satisfactory in use; and steel, reinforced concrete, cantilevered slab construction, are at the architect's service for buildings of various type. The skeleton is sound, and well adapted on the whole to present needs. But there remains the question of the skin, the envelope which is to be stretched upon the frame.

At this stage must be considered a question which has an important bearing on the future of architectural development; this question relates to the relative permanence of buildings.

Sir Owen Williams, the distinguished engineer, has been reported as pointing out (*vide The National Builder*, January, 1929) the need for distinguishing between the monumental building, intended to last as long as our civilisation, and the ephemeral type of building, which should not outlive its usefulness. 'The commercial building must have a life fixed by economic necessities and, like motor cars, should be easily scrapped when new conditions arise.'

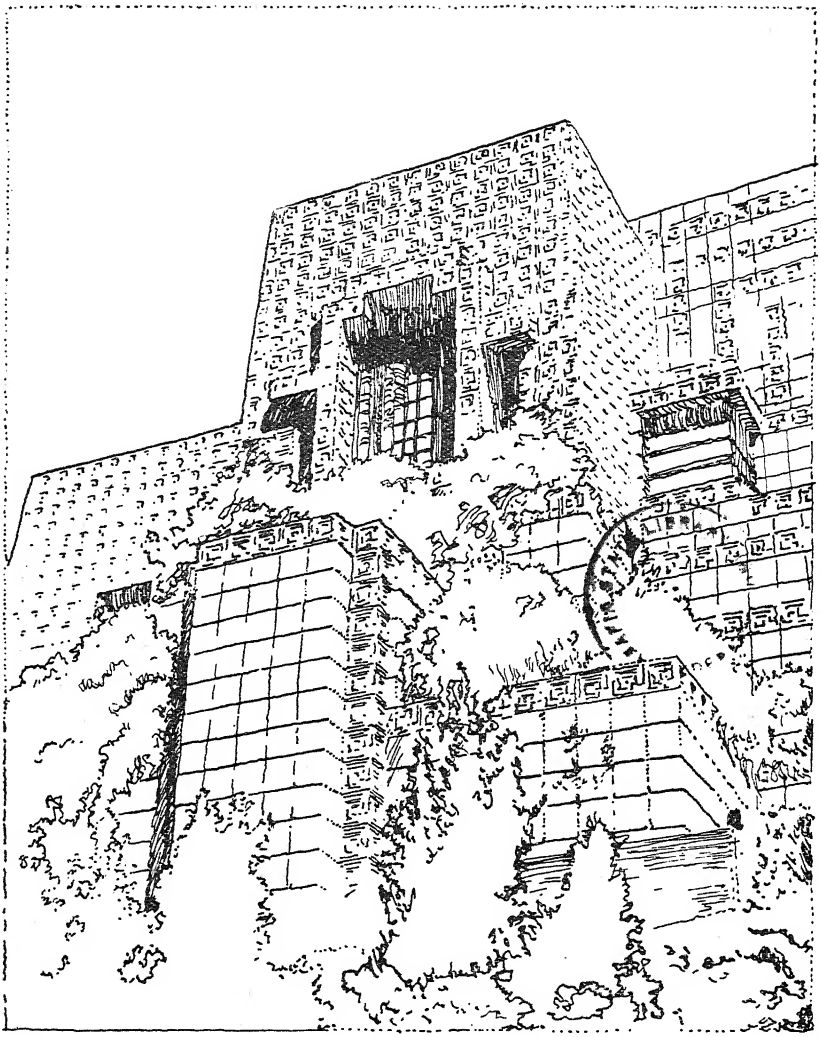

FIG. 31.—Dining Room Bay at the Innes House, Los Angeles. Frank Lloyd Wright, architect.

In Sir Owen Williams' opinion 'too much effort is expended on making such buildings permanent, and nothing can justify the application of thin coatings of stone to give an apparent robustness which the buildings cannot possibly possess. Modern construction is half way between the permanent and the impermanent. It is not sufficiently temporary to justify quick dismantling to meet such changes as those raised by traffic problems or the commercial development of large sites. On the other hand, it is not sufficiently permanent to prevent it from becoming a source of danger or annoyance in its later life.'

'The remedy is a change in the mental outlook of architects and owners. Monumental buildings should not contain steel framework. It is for more temporary commercial buildings that steel has its field of usefulness, and in these cases the prevention of undue corrosion lies in the control of concrete mixing and the intelligent use of paint.'

Sir Owen Williams' opinions are of great interest, as coming from an engineer endowed with high technical skill coupled with vigour of imagination. To follow his argument to its conclusion, however, it would appear that no permanent monumental building should be erected to a great height, until the day dawns when steel can be safely eliminated from the construction of tall buildings. What is perhaps more probable, is a decrease in the ambition to build 'to last as long as our civilisation,' except in the case of such buildings as churches, memorials and monuments. The most interesting development would then be in the direction of impermanence; and here, as Sir Owen Williams points out, there is a hiatus in our structural system. If stone and brick are more permanent materials than steel, it seems illogical to use them in dependence upon the less

durable framework, and some other material, the character of which is based on its suitability to frame construction, should be evolved.

The present system of building up, on the successive floor girders of a skyscraper, a skin which is similar to that used on a single-storey house, seems obsolete in principle. The unit is small, it has to be very much worked and adjusted on the job, and the labour item is excessive. The skin is heavy, and therefore, in theory, uneconomic. The brick or stone skin has been in use for centuries; the steel and concrete frame are of yesterday. Yet they are daily used in conjunction.

The great stumbling-block to structural progress to-day seems, therefore, to be the lack of a suitable composition for outside walling; the skin of the building has not been developed to the same degree as the frame.

Many materials have been tried. Solid concrete, hollow concrete, concrete combined with cork, with tile, or with both; finishes applied on metal lath with a cement gun; walls of asbestos, of compressed straw, of steel plates. Data is incomplete as to the results obtained with many of these methods, particularly in respect of durability and cost of maintenance. But as far as it is possible to judge, none of these materials are in a fair way to replace brick and stone. The most reliable materials seem to be those which are nearest to nature in their composition.

The requirements of an ideal walling or filling material are so numerous, and sometimes so contradictory, that it is easy to see why none has up till the present been produced.

Let us take, for instance, the factor of economy. To be economic, the material must not only be cheap in itself, but must tend towards lowering the cost of all the elements of

structure such as walls, partitions, roofs. It must be suited to various uses, involving technical requirements very frequently dissimilar. It must be light, effecting diminution of tonnage in transport, of dead weight, of foundation loads, of size of structural members.

Yet it must be so strong and rigid that it may be made of such thinness that its use will contribute substantially to an increase of room space. It must be easy to manufacture and assemble, thus effecting economy of labour and time.

As regards utility, this ideal material must be sound-proof, a thermal insulator, non-combustible, and damp-proof, vermin-proof, rot-proof.

The greatest promise at present seems to lie in the direction of concrete, particularly in the development of the idea of ' cellular concrete,' whereby the concrete is honeycombed with tiny air spaces. This material is light, incombustible, of reasonable strength, but it requires to have the capacity to withstand sudden changes of temperature without cracking.

Perhaps one reason why the perfect wall has not yet arrived lies in a lack of complete satisfaction with regard to the frame itself. The present frame system is satisfactory, but there is nothing to show that it cannot be improved upon. For example, under present conditions too much structural work has to be done upon the actual site, where conditions of work are necessarily far from ideal. If far more of the units of structure could be delivered in standard sizes, and fitted easily together, something approaching factory production under favourable conditions might be achieved. In small work, such as two or three storey buildings, for example, it is possible that an advance in this direction may be expected.

Let us take, for instance, the average method of construction, where the walls support the structure and the bulk of the main upper walls are carried by walls below. This type of structure might be replaced by one in which stanchions and beams were erected as a framework, and the floors and walls were filled in by some of the walling preparations which have been previously mentioned. But even in this case, the bulk of the work is work upon the site.

It is possible to conceive, perhaps, of a house built upon a system of precast units consisting of hollow reinforced concrete posts, beams, and floor slabs, all of a limited number of varying standard sizes, which could be linked together by the pouring of concrete into the hollows, this method of unification being utilised much in the way that soldering or welding is employed in metals. Might it not be possible to build a ground floor of these elements, complete with floor slab, so that it would stand as a monolith upon its raft foundation, and then at first-floor level recommence the process, utilising the finished floor slab in each case as the raft for the floor above? The work of erection would be simplified, scaffolding would be practically eliminated, and the units used would be of a size which it is *possible to transport*. Each floor would be automatically enclosed with walls and roof as each stage was reached, and the partitions and equipment could be properly set out, with greater ease of work for the trades involved.

This idea, which has been put forward by the French architect Henri Sauvage, is not one which involves anything very novel in materials and construction, but is interesting from the organisation standpoint; and it is here that progress may be possible. Constructionally, our structure is good. Economically, structural systems might be

improved, and as building costs must somehow be reduced, this aspect of structure deserves close scrutiny.

Much is being done on these lines abroad, especially by Sauvage, who is one of the most inventive, practical, and interesting contributors to the solution of this question. He has experimented with unit construction of various types; and his work, which is directed towards improvements in method of designing, producing, and assembling of materials, the properties of which are to a certain degree proven, is possibly more capable of bearing fruit than efforts to branch off into the use of such substitute materials as have been tried in the steel-plated houses of England and Germany, which can hardly be claimed to have even approached success. The main idea behind the steel house was right. It was to find a method of better production. But the choice of steel as a material on which to base this effort seems difficult to justify. It is hard to imagine any material less adaptable—let alone sympathetic—to the requirements of domestic building.

The field of the architect, as regards structure, seems at the moment to be defined by the limitations of the specialists who are advising him. He is aware of present practice, of what is reasonably safe in planning for structure; he is wise enough to work out his problems with the structural engineer, and to bring his own suggestions forward for what they are worth. But the engineer himself is dependent upon the range of materials available; he is not yet in a position to provide perfect materials, nor perfect methods of production. That is perhaps the task of what we loosely call the 'Building Industry,' the manufacturers, the merchants, the builders, together with the Building Materials Research specialists whose activity is so rapidly developing.

But perfected structural technique can only be evolved by the *joint* effort of all these three participants in the building problem.

The first step is to define our structural aims; the second to review the extent of the limitations set up by present methods. The third step would be the promotion of an organised effort to evolve the means of removing the limitations.

III

Materials for the Exterior

UNDER the heading of structure the question of materials has already been touched upon, for consideration of their properties naturally forms an integral part of the structural problem.

A really profound knowledge of materials is nowadays a very difficult thing to acquire. Gone are the good old days when the architect with an average practice could be considered quite well informed if he were familiar with bricks, stones, marbles, woods, and a very few proprietary materials. To-day that range is not nearly wide enough. All sorts of products are on the market, many of them with properties which are to a certain extent a sealed book even to those who market them; and even the staple materials, brick, wood, metals, are being treated in all sorts of novel ways. As a result of this situation, the acquisition of an intimate acquaintance with the full range of available materials, their properties, their advantages and drawbacks, is becoming almost a life-time job; and the architect, faced with increasing complexities in nearly every section of building work, cannot hope to be *au courant* except in a general way.

To meet this difficulty, a central bureau of materials, to which all architects can refer their enquiries, becomes a practical necessity. In New York and Philadelphia are very well-equipped Architects' Bureaux, and in London the Architectural Association, foreseeing the trend of the times, has organised a very carefully-formed nucleus of a similar

nature, which will almost certainly develop as an important aid to the Building Industry as well as to architects. The formation of such a bureau is one of the necessary steps in the improvement of the general organisation of building processes.[1]

Acquaintance with materials is one of the most important factors in the architect's success or failure as a designer. Obviously, the drawing of an elevation cannot convey the texture and colour of materials, the quality of surface which is such a vital part of the actual effect. The designer must be able to form a mental picture of his façades, in their material, in just the same as he should be able to visualise his interiors. But he cannot visualise materials unless he has seen them employed either in buildings or in very large samples. Two or three specimen bricks, for instance, may give a very deceptive idea of the appearance of the completed wall.

Nowadays, therefore, the architect should tear himself away from his office much more frequently than was formerly necessary, and devote a goodly proportion of his time to observation. Ideally, he should not confine himself to his own country. For experiment in new materials, and in fresh treatments of familiar materials, is one of the most stimulating features of modern continental architecture.

The value of measured work as part of an architect's training has always been stressed by educationists. But it is noticeable that measured drawings rarely reveal any detail about the materials of old work. Mention of the type of stone or brickwork employed is frequently omitted, there is often no information as to effects of weathering and

[1] Note: At the time of going to press we understand that a large Bureau of this type is actually in process of formation.—H. R.

resistance to atmosphere, no detail record of the size and treatments of jointing, a most important element of character in brickwork and masonry. Old work depends to an enormous extent also upon its materials and craftsmanship; and were it not for a few books illustrated by large-scale photographs, such as Nathaniel Lloyd's *A History of English Brickwork*, records of much of the craftsman's technique in design would gradually disappear.

In modern architecture, very fortunately, there is every stimulus to revive an intimate knowledge of materials and their working—for present-day design is sparing of detail and simple in its main lines, and such simplicity demands superlative care and quality in execution.

In dress design, it often happens that the simple model is the most expensive, for the reason that the elimination of fussiness throws the whole burden of success or failure on to basic qualities of line and materials. In architectural design the situation is the same.

Most architects have attempted, in their younger days, to whittle down the cost of a cheap house by eliminating all mouldings from skirtings, doors and architraves. 'Just simple surfaces, with no superfluous and costly mouldings.' But in dealing with these plain surfaces, each mitre and joint has to be perfectly worked if it is to withstand close scrutiny. Where a joiner might ordinarily cover up a discrepancy by a bead or fillet, and diminish the effect of a faulty mitre by losing it in the lights and shades of a moulding, the régime of plane surfaces compels him to minute exactitude, and the careful selection of his materials. 'All to the good,' it may be argued; 'since fine workmanship under these circumstances becomes a necessity.' Agreed, if people are willing to pay the price. For good craftsmanship takes time, and

time is money; and large rooms at a small cost cannot be produced on the quality basis.

This example is used merely to illustrate an important point in regard to modern design, namely that its simplicity does not necessarily spell economy. Every pound saved on elimination of detail, should, in theory, be put towards better quality. To spend money in that way is a good investment, but nevertheless the money is spent. And the alternative, cheap simplicity, is extremely difficult to achieve in practice.

The elimination of ' features ' in design throws the onus for design interest upon rightness of proportion and also upon surface. A basic element in the envelope of a building is its surface, with all its elements of character, such as texture, colour, and properties in respect of absorption or refraction of light. It is therefore necessary for the architect to possess a knowledge of the surface characteristics of the principal materials available. He must also be familiar with their properties as regards ' workability,' the extent to which the surface can be played upon either plastically—in the form of modelling—or pictorially—in the form of the application of polishes, pigments, overlays, and so forth. The third requisite is technique in the assemblage of the units of surface, involving questions of natural structural limitations, and problems of jointing and assemblage.

Modern research in the essentials of architectural form has inevitably led to a consideration *de novo* of the materials in which form is realised, with the consequence that the development of a large and fertile new technique in utilising every resource of materials may be expected. There are grounds for this expectation, since in much modern work it

is being increasingly realised that the question of choice and handling of materials is inseparable from the study of form. In other words, forms must be created for execution in a particular material, and in that material alone will they realise the full expectations of the designer.

The significance of this is not to be missed; for it foreshadows the death of the reach-me-down attitude towards architectural design, which has led to the production of elevations which could be executed in brick, stone, or stucco, according to taste. Elevations of this type can only be moderately successful; for, not being conceived with the properties of any particular material in mind, they lack in execution that special vitality which springs from perfect suitability to material.

Character is often revealed in actual building which is almost impossible to convey on the drawing-board, and is frequently derived from a particular technique in the handling of materials.

One instance occurs in the jointing of ashlar masonry, the pattern and design of which plays a most important part in the effect of a stone-faced building. For example, the treatment of stonework with a raked-back joint produces an impression of character quite different from that realised with a flush jointing. A modern building in which the former treatment is applied is the School of Hygiene and Tropical Medicine in Gower Street, by P. Morley Horder and V. O. Rees (Fig. 33). The architects have visualised their masonry surfaces from the outset as treated in this way. The effect produced in this case is that of a definite rectangularity, of an emphasis of the block form, which is in strict harmony with the impression of the major form of this building. To take another case, raked-out joints are

also employed in the Victoria and Albert Museum at South Kensington, by Sir Aston Webb, a building of utterly different character. But in this building the modelling of surface is busy and intricate, and the recessed joints, which of course follow the contours of the profiles, enhance this impression of intricacy by drawing a kind of reticulation over the general imbroglio. In both cases there is a sense of emphasis, through accentuated joints which underline the play of form, of the characteristics of this form. It does not follow that such emphasis is always desirable; it may not be. The recessing of joints may result in an overstatement of characteristics which through form alone are already sufficiently stressed. But what the designer can, and should, recognise is the fact that technique in the handling of material can assist in obtaining effects desired in major form.

Brickwork is a material offering endless scope for characterisation. Here, again, the elevation on the drawing-board shows merely lines, and generally only horizontal ones at that. Yet the selection of a particular type of brick bond may throw a characteristic pattern over the whole façade; and the designer should be aware of the effects involved and be able to employ them consciously. Types of jointing are a study in themselves. For example, a very wide, flush, and smeared joint in lime mortar imparts a rather rustic character, the success of which depends largely on the quality of brick employed; a rustic piece of brickwork, in a London building, may appear as a delightful piece of whimsicality, or it may appear as an irritating display of affectation, particularly if poorly executed. The whole question depends upon the type of building, on how it is handled, on the type of characterisation at which the architect

is aiming; and particularly on whether he realises what he is doing, and is employing his technique with a definite and justifiable objective in his mind (Fig. 32).

Architects of the modern school lay increasing stress upon their brickwork and its jointing, and a considerable amount of interesting experiment has been made. Wilheim Kreis, for instance, in his art museums at Düsseldorf, has introduced courses which at intervals project slightly forward, giving an effect of horizontal banding; the directional emphasis thus obtained is impressive, but the treatment has been criticised as bad from the practical standpoint, on the score that water remains on the projecting ledges thus formed, and in winter is apt to freeze and break up the mortar (Fig. 34). Dudok, in his schools at Hilversum, has used a raked-back horizontal joint and a narrower flush vertical joint, so that the horizontals of the brickwork are stressed in harmony with the long lines of the buildings. Internally, the vertical mortar joints in some of Dudok's school interiors are eliminated altogether, and the wide horizontal joints are kept very wide and deep, so that this effect of horizontal line is still further emphasised. In this case the motive appears to be almost entirely a decorative one, and is interesting as an example of the care which this architect devotes to all matters of detail (Fig. 35).

Snug, neat jointing, in which no rustic uneven effects are sought, is to-day becoming more popular as being in accord with the trim lines of modern massing and detail. Many architects still go out of their way to ensure that ' perpends ' will not be directly above each other, so as to soften the general effect of brickwork. But, unless the brick used is naturally uneven, such artifices seem a little far-fetched; they are really on the same plane as hand-roughening with the

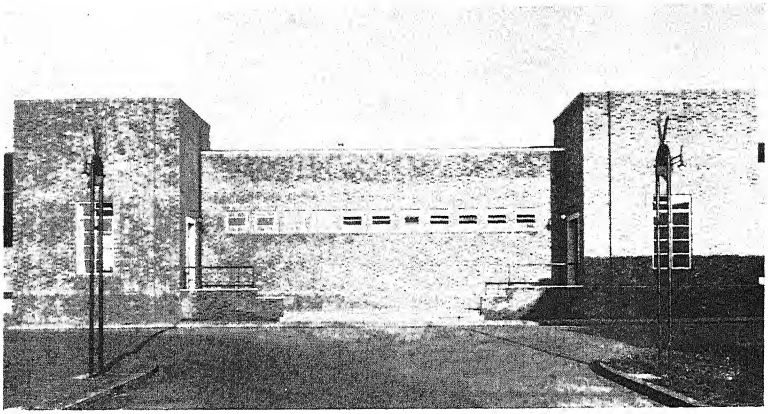

FIG. 32.—Warehouse of the Oxford University Press, Neasden, by Stanley Hall and Easton and Robertson.

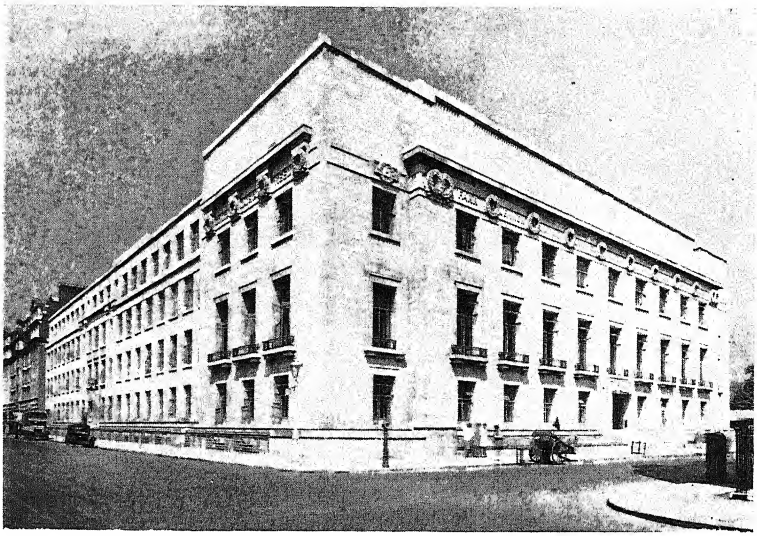

FIG. 33.—The School of Hygiene and Tropical Medicine, London, by P. Morley Horder and V. O. Rees. The texture of the stone jointing plays an important part in a design embodying plain surfaces.

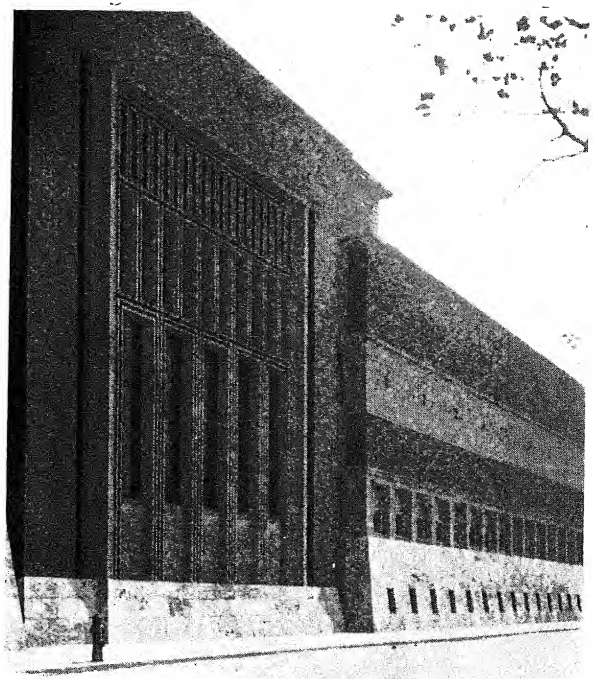

FIG. 34.—Art Museum at Düsseldorf, by Wilhelm Kreis, with a ribbed wall surface of brickwork.

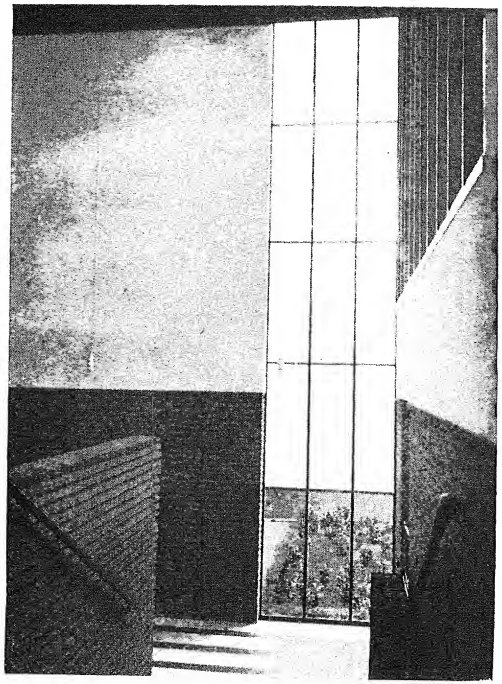

FIG. 35.—Staircase in a school at Hilversum, by W. M. Dudok. Horizontal joints are stressed; vertical joint spaces are practically eliminated.

adze applied to timber which is machine wrot and perfectly smooth.

The use of good materials will not suffice to ensure satisfactory effects if the architect is careless in the handling of his details. Junctions of different materials, such familiar problems as flashings against chimneys, dormer cheeks, the

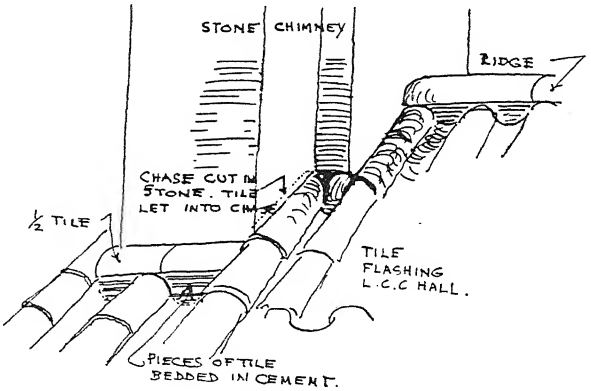

FIG. 36.—Sketch of the finish of pantiles to chimney stack, the London County Hall. Ralph Knott, architect.

finishing-off of asphalt on stone cornices, the handling of swept valleys in tile roofs, the covering of hips and ridges, still remain as points requiring care in detail. Everyone, for instance, who has met with the problem of securing a neat finishing against chimneys and dormers of pantiles will realise this truth. Many clever solutions are available for most of these routine problems, in old work especially, and the modern architect is not absolved, because of his absorption in the complexities of present-day design, from the necessity of acquiring a thorough technique in standard and well-proved building methods (Fig. 36).

On the other hand, there are new materials and fresh possibilities as regards form, which supply the incentive to

pioneer and seek for new solutions to old problems. For example, the necessity for employing heavy framing round openings, and thick supports in general, is one which many modern architects would like to eliminate on the score of both utility and effect; yet the use of materials in such a way as to achieve the effects desired requires a considerable amount both of invention and technical skill. Effects are obtained by some of the more advanced modernists which at first glance are puzzling. To quote an instance, there is the effect which Dudok introduces in his long lines of windows, without visible solid piers, occurring immediately beneath an overhanging slab of concrete roof. Apparently the roof slab is carried on the thin metal casements, and the effect is very light and attractive; but what actually happens, however, is that the sets of metal windows are separated by 1″ iron bars, which connect with the reinforcements of the roofing slab. These bars are at frequent intervals, and take the place of stouter posts which would normally be placed at greater distances apart.

Another neat device of this same architect occurs in his handling of very wide brick window heads, which clearly are not self-supporting, though to the casual observer no beam or lintel is obvious. Dudok builds his bricks upon a narrow shelf of concrete projecting like a platform from the lower edge of his concrete lintel; this shelf is visible on elevation as a narrow grey band, and looks effective as well as structural, since it provides not only a support but also forms the soffit of the window-head.

Continental designers are very clever in their handling of materials and in obtaining desired effects by perfectly legitimate means. In fact, a new technique in materials is being developed, which can only be really studied at first

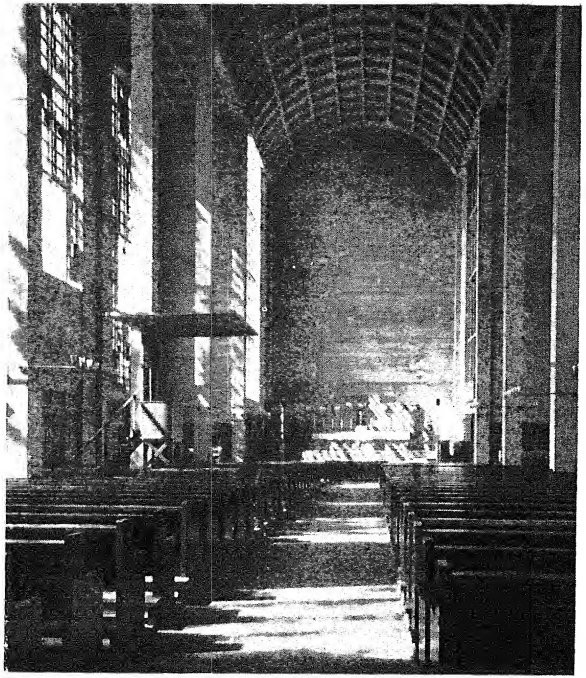

FIG. 37.—Structure and walls of the Church of St. Antoine, at Bâle, are of reinforced concrete. Karl Moser, architect.

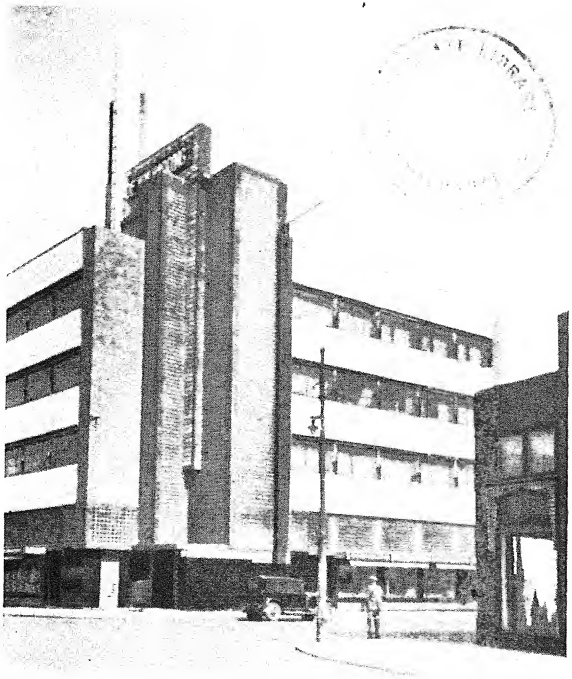

FIG. 38.—The Vol Harding Co-operative Building at the Hague, by J. R. Buijs. The bands of white opal glass become illuminated advertisement panels at nighttime, being lit from within.

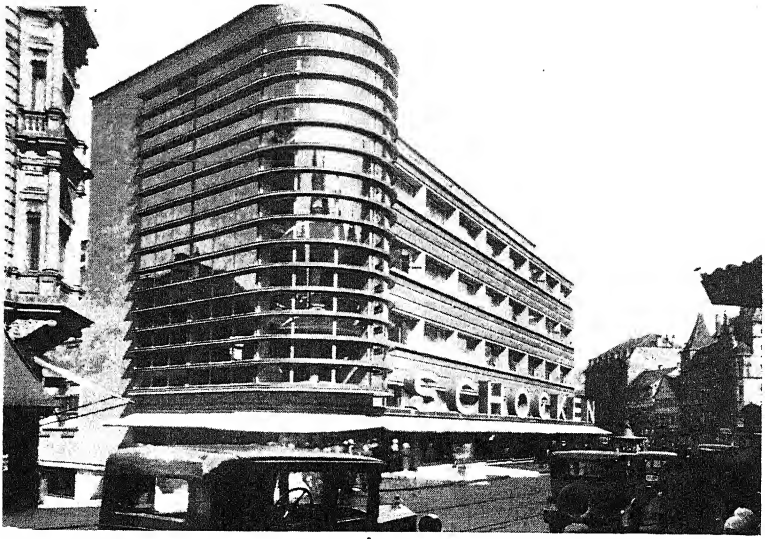

FIG. 39.—The glass staircase enclosure of the steel-frame Schocken Store at Stuttgart, by Erich Mendelsohn.

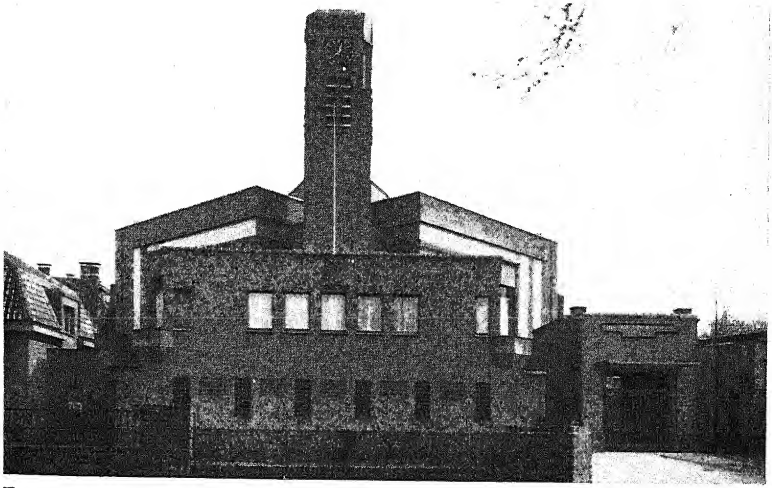

FIG. 40.—Christian Science Church at the Hague, by H. P. Berlage, who recently received the Gold Medal of the Royal Institute of British Architects. The small ground floor windows are formed with glass bricks.

hand by a close examination of individual examples. For instance, Dutch methods in walling, particularly in brickwork, are full of inspiration, both as regards broad effects and detail; and other countries contribute severally to the fund of knowledge in the treatment of metals, concrete, glass, and other materials.

Glass especially is a most intriguing material for modern work, and requires considerable skill in handling as well as wide research on the part of manufacturers as to the possible scope of its uses.

Examples of outstanding interest are provided by such buildings as the Vol Harding at the Hague, designed by J. R. Buijs. The design of the façade of this building is based almost entirely upon the use of glass, the two principal features of interest being the very daring staircase wall, which is constructed from bottom to top entirely of glass bricks, without any steel framing or other intermediate support, and the panels below the windows. These latter are virtually glass lighting boxes on which luminous advertising can be thrown from within as upon a screen. In the daytime these panels appear as a white opal surface, and at night as luminous signs (Fig. 38).

Glass bricks are used increasingly in Holland, in white and in colour, an attractive example occurring in the interesting Christian Science Church at the Hague by that pioneer in modernism, Berlage, who employs these bricks in combinations of green and white (Fig. 40).

A very bold use of glass, along quite other lines, is made in Erich Mendelsohn's Schocken Store in Stuttgart. This steel frame structure has a staircase tower entirely enclosed in glass, the staircase being supported on a central pillar, quite free of the walls (Fig. 39). This piece of design is

technically very bold, though not entirely new, for a similar treatment occurred in the 'Machinery Hall' by Walter Gropius at the Cologne Werkbund Exhibition of 1914.

The difficulty which the architect has to face in respect of such materials as glass, or any other material used in a new way or on an unusually bold scale, is the lack of reliable data as to the capacity of the material, and uncertainty as to the possible troubles which may arise through causes impossible to foresee during the design stage. One may well imagine, for example, that the architects and builders responsible for the Garage Marbeuf in Paris were not without qualms as to the behaviour of the gigantic plate glass window which forms practically the whole front of this original and daring building. In some countries it would be very difficult to persuade either the client or the structural specialist to venture upon such an experiment as this, for the manufacture, and especially the fitting, of panes of such magnitude must have presented many new problems (there are 18 panes, each 7 metres by 3.10 metres, and the window area totals 21 metres by 18.60 metres). (Fig. 41, page 105.)

A material of great interest at the present time is stainless steel, which is being increasingly employed (Fig. 44, page 106). Here again both the designer and worker in this material have a good deal to learn, especially the former, who is apt not to realise the hardness of the material and the particular forms to which it lends itself the most naturally and economically. Stainless steel depends for the maintenance of its 'stainlessness' upon the surface polish, and requires to be kept clean by periodical washing; architects using it for outside work in cities with a smoke-laden atmosphere should remember this, and avoid types of textured design unduly intricate and difficult to maintain.

Another material said to be of considerable promise for exterior work is slate, which is now on the market in large sizes, which can be built up as slabs and secured by screws. The surface of the slate can be treated with a metallic finish, for which great durability is claimed.

Research in the protection of metals, in the production of new alloys, in combinations of wood with metal, of glass with concrete, are constantly going forward; the architect can scarcely keep pace with the interesting ideas and actual materials brought forward to tempt him down new avenues of design. At present, perhaps, there are more examples of interesting possibilities in materials than there are designers with the skill and courage to make use of them. But that is natural since, in the main, it is the existence of the material which creates the desire to use it, and ultimately the appropriate expression; in addition to which the use of untried materials throws a heavy responsibility on the architect. In some cases, however, a material has been evolved to meet an express demand, and has subsequently become a standard product, an instance being the grey sprayed bricks which have been used by Sir Giles Scott for the facings of his own house in Bayswater, and in the office building at 52 Cornhill, by Stanley Hall and Easton and Robertson (Fig. 42, page 105).

Technique in materials can, like technique in any other form of expression, become almost an obsession, and lead the architect away from the straight path of logic. An example which is perilously near the border-line is provided by the Hamburg architect, Fritz Höger, who has probably done more than any other man to revive the popularity of common ' klinker ' brick in Northern Germany as a material for modern construction. Technically, Höger is an archi-

tectural giant. He is able to produce fine and simple effects with his great surfaces of this almost vitreous brick (Fig. 48, page 110); but he also loses himself in bravura themes, which become almost an object in themselves; and sometimes these themes have more technical interest than real structural significance, as in the case of the Hamburg Tobacco Factory (Fig. 45, page 109). There is generally, however, an excuse for extravagance of this sort, and in this case it lies in the value of the advertisement which a building of this elaboration procures for its owners. Why, otherwise, should Carreras, the Firestone Company, and a score of other big concerns bother to spend money on embellishing the external envelope in which they enclose their utilitarian working spaces ?

Mention of these latter buildings brings up the question of polychromy, which enters very largely into the design of both buildings, as well as into that of a gradually increasing number of commercial structures of similar type, such as the Hoover Factory, and the Pyrene Factory at Brentford, by Wallis Gilbert and Partners, who are also the architects of the Firestone Factory (Fig. 43, page 106).

Polychromy is probably of greater value in isolated buildings than in city streets, where broad effects of unity are desirable, owing to the number of incidental elements of interest, such as shop fronts, signs, vehicles. These elements are frequently polychromatic, and to relate them a fairly uniform background is required. Polychromy on a big scale only attains its full value where the element of isolation intervenes, and this is rare in cities, though Carreras' building provides a case in point.

Paint as a medium of polychromy is rather ephemeral, though attractive effects can be realised where upkeep is

maintained (*e.g.* Stagg & Mantle's premises in Leicester Square). More significant is the enamel work in colour executed by the Birmingham Guild on 'Ideal House' in Argyll Place, designed by Raymond Hood and Gordon Jeeves. Here we have a façade in polished black Swedish granite, which, when clean, reflects both the sky and adjoining buildings, and thus contributes to an effect of space which in town is valuable (Fig. 46, page 109).

Bright colour has a definite value in street architecture of cities when used with discretion, and may contribute a welcome note of gaiety, as in the case of Liberty's 'Tudor' shop, opposite to 'Ideal House.' Whereas complete polychromy would probably defeat its own ends.

On such small elements as the shop-front, however, polychrome treatments can be indulged in to the fullest extent, and a wide choice of materials, such as enamelled metal, stainless steel, cellulosed plywoods and composition boards, marbles, decorated asbestos, artificial compositions, is available to provide a charming repertory of effects. In shop-front design the architect will be wise first to regard the shops which will be the neighbours of his own, before deciding on a type of treatment. Harmony or complete contrast are both open to the architect who wishes to give value to his design. But to obtain contrast it will often be found, in these days of flashy and over-emphatic shop-fronts, that very sober treatments produce the greatest effect. It is a similar case to that of the leading lady who, in the midst of a chorus dressed in the full rainbow scale, appears in a simple black dress and automatically becomes the central figure.

A criticism which has been levelled against architecture of the modernist school is that it shows no respect and feeling

for materials. It is said that a design for a building can be executed in almost anything without radically altering it, that too many modern façades are conceived without thought of any particular material in mind.

This is true only within limitations. Much Dutch architecture, for instance, is obviously designed for brick. The big apartment houses and smaller villas of Holland would be quite altered in effect if executed in concrete; and not only is this true of the kind of material, but of the various grades of that material. Take, for instance, some of the latest work of Dudok, which is built in a pale yellow brick of even colour and texture. That brick has a peculiar character; it is a first-rate foil for the brilliant colours, blue and orange, which Dudok affects. It is obvious that if these buildings of Dudok's were built in a multi-coloured red brick, many items of general effect would have to be altered in consequence. The conception of a mechanical smoothness acting as a foil for brilliant colour would have disappeared (Fig. 47, page 110).

What is important to recognise is the fact that, with the dominance of machine production, the designer must turn his attention away from handicraft associations, and concentrate on design which is characteristic of machine methods. If he is using machine-made bricks, it is a pity to attempt to usurp hand-made effects. Poetry can be introduced through other methods of approach. Greek work was extraordinarily precise and mechanically perfect; yet it was poetical to a high degree.

IV

Expression

'ARCHITECTURAL expression' is a wide term covering not only the outward manifestation of the inner purpose of the building, *i.e.* the characterisation of the building programme, but also questions of manners, of the personal equation of the 'ego' of both client and architect, and of the claims of materials and structure to be expressed for their own sake, either directly or by implication. It also involves questions of architectural 'deceit' or 'honesty,' and of the border-line between legitimate make-believe and trickery.

Many interesting pages have been written in discussion of those factors which should dominate in architectural expression, such as structure, materials, function, etc. These factors have been set up and emphasised by writers on architectural theory, in some cases as examples of guiding directives in design, in others as so many 'Aunt Sallies' to be effectively demolished. But perhaps one reason for the lack of general agreement on this question of relative dominance lies in the failure first to enquire as to what is the principal aim in building. If this aim could be determined in each main period of history, including our own, it might clarify our ideas as to the outward and visible expression of that aim; and it might lead us to the conclusion that aims vary with epochs, and that in consequence dominating influences in expression are by no means constant. In which case the eternal differences of opinion would be explained,

for it might then be admitted that expression in, say, the twentieth century would conceivably not be inspired by the same ideals as those which governed in the heyday of Greek or Mediæval architecture.

Broadly speaking, it appears incontrovertible that the primary object in the creation of buildings—apart from monuments, which to all intents and purposes may better be classed as sculpture—has always been to enclose space for some defined human activity. So far, therefore, the problem appears to be the same to-day as it was five thousand years ago. But there remains the question of the programme presented to the architect in connection with this operation, for obviously the purpose and character of the space to be provided will profoundly affect the solution adopted, and in consequence the expression of the solution.

We have seen, in discussing the question of the plan, that the demand on the architect has become increasingly exacting as civilisation advances. The programme of Egyptian and Greek architecture, for instance, was distinctly limited. The civilisation of the day was comparatively unexacting in its practical architectural requirements; this is accounted for by the then existing state of social development, and also by the limitations of the materials and methods of structure available.

These latter, being fairly primitive and direct in character, impressed themselves very strongly on architectural form. Buildings in Egyptian and Greek times were, in their expression, largely the outcome of confessed limitations. Methods of construction imposed themselves as the *leit-motiv* of design, they pervaded everything in the building, became fundamental to the conception. We find in Greek work the dominance of the motives of stone and wood construction,

reminiscences of the effort expended on the latter persisting in the former. Then comes the actual treatment of these governing motives, depending upon the purpose of the building; simplicity for the house, where interest was centred largely on the interior, proud decoration for the temple, where external magnificence was part of the 'demand' imposed on the architect by the function of the building.

The planning of a house, or of a temple, constituted in Greek times a use of space which was fairly definite and static. The conception of the temple, in particular, always remained fairly constant. We find architectural expression closely bound up with a comparatively fixed and unambitious set of requirements, with a primitive and restricted system of structure, and developed through a process of intensive culture until we come to the zenith of Greek architectural achievement.

In Roman times, the demand in respect of the utilisation of space was much more exacting. Big markets, public baths, theatres, luxurious villas were typical requirements of the time. We have seen that structural solutions were to hand, particularly in the form of brick, tile, and concrete construction.

Roman architectural expression was based upon recognised and established forms, these being stabilised by a certain uniformity of the requirements of programme, and by the adoption of a structural system which was flexible in meeting design requirements, but which, once established, was permanent and unalterable. The form and mass of Roman buildings were directly controlled by the definition of the space within; the space was enveloped by structure which depended directly upon the nature and character of the space.

The modelling of external and internal form being thus dictated and related, and realised in materials distinguished more by strength than elegance, there remained the question of treatment. The Romans quite naturally followed the logical procedure of applying richer surface and modelling to the plain structure; and they employed the vocabulary of form and detail which was the most developed and accessible, that derived from Greece. Greek forms, once structural, were borrowed for embellishment, and thus lost some of their significance. But it must be borne in mind that much of the pleasure derived from form is that of reminiscence; so that, to the eye of the public at any rate, the applied elements were probably satisfactory.

Divorced from their primitive and strictly structural function, these elements could be used in a great variety of forms and combinations. The versatility of the Romans in this matter of adaptation is one of the causes why Roman, and not Greek, work has been so widely studied by modern architects for its possible applications to present problems.

In Mediæval work the demand was for greater freedom of space, a possibility of subdivision which would not be controlled by ponderous structure. Space, in a Gothic structure, became for the first time comparatively free, the physical limitations residing in the span, the height, and in the plan area sacrificed to structural members such as buttresses.

Expression in Gothic times was directly involved with structure. But, owing to the limitations of masonry, form was not free. The sternness of the necessities of structural stability which lay behind Gothic conceptions is recognisable; which perhaps accounts for the extent to which, as a contrast, fancy and whimsicality in decoration are allowed to play so freely upon the structural theme.

Renaissance expression is involved with the very meaning of ' Renaissance '—rebirth. Form struggled to be free, to enjoy the advantages of a developed building technique, and yet to remain within the formulæ implied by ' Renaissance.' Interest in the possibilities of plastic shape, in the enrichment and decoration of it, became a dominant factor in expression, since little was in the main contributed towards the solution of the basic ' space problem.' The dictates of form, as developed and proportioned for eye pleasure, at times ran counter to the dictates of practical structure; and an achievement of the later Renaissance architects was a frank recognition of the fact that eye pleasure and structural line have at times to be cajoled into a *modus vivendi.* An example, previously alluded to, is that of the dome of Florence Cathedral. The mass and silhouette externally are magnificent; but internally the octagonal dome on its crossing is like a great gaunt canopy at the top of a shaft. Michelangelo and his successors recognised the necessity of a secondary internal dome to meet the demands of effect from the internal viewpoint.

Since Renaissance architecture was relatively tied down—the internal economy of buildings being adjusted to structural limitations—designers came to envisage the possibilities of comparative divorce between interior distribution and structure, and the external plastic effects of pure form. In Baroque architecture façades became so much scenery, often quite unrelated to the interior. That has been condemned as false and dishonest. But in reality it was a true expression, not of the material requirements of building, but of the ideal of creating forms which in themselves might have a message, independently of a structure which had reached its technical limitations.

In other words, late Renaissance architects would probably have enjoyed structural freedom, but were not in a position to obtain it. As a palliative, and as an emotional outlet, they developed the principle of the independent screen façade, and created free architectural 'scenery.'

This stage brings us—if we pass over insignificant stylistic revivals—to the point at which we have arrived at the present time.

To-day, we find ourselves, thanks to mechanical progress in structure, in a unique position. We have structural systems which can give us, if we are willing to pay for them, practically complete control of space; we can span huge voids, we can enclose vertical space to practically any height. For the first time in history architects are within reach of freedom; the problem of space enclosure is virtually solved (Fig. 12, page 32).

What should be the architectural expression typical of this situation? Should it be that of structure, which may be based on a variety of engineering systems all achieving more or less the same result? Should it be that of 'face' materials, which, as the term implies, are materials of an envelope, applied to a solid or skeleton framework? Should it be that of plan—that is to say, shall we attempt to make of the façade a faithful notice-board of the internal divisions of the plan and their various functions? Or should expression be an indication of the purpose for which the building is erected?

Of all these bases for expression, the last is perhaps the most important. For the utilisation of façade treatment as a means to express purpose reveals that one thing which to the beholder is important, namely the answer to the question, 'What kind of building is it?' 'Is it a museum, a cinema, a factory, a church?' (Fig. 65, page 137).

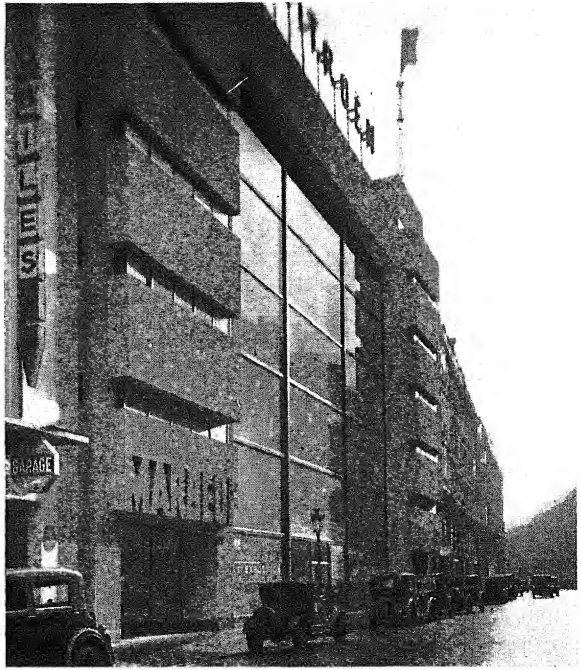

FIG. 41.—The Garage Marbeuf, Paris, by Laprade and Bazin, with an all-glass centre façade panel.

FIG. 42.—Office building at 52 Cornhill, by Stanley Hall and Easton and Robertson.

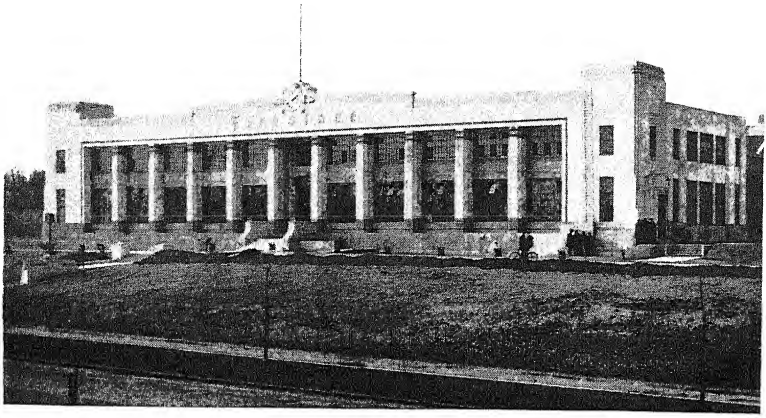

FIG. 43.—The Firestone Factory, Middlesex, by Wallis Gilbert and Partners, in which polychrome relief is ably employed.

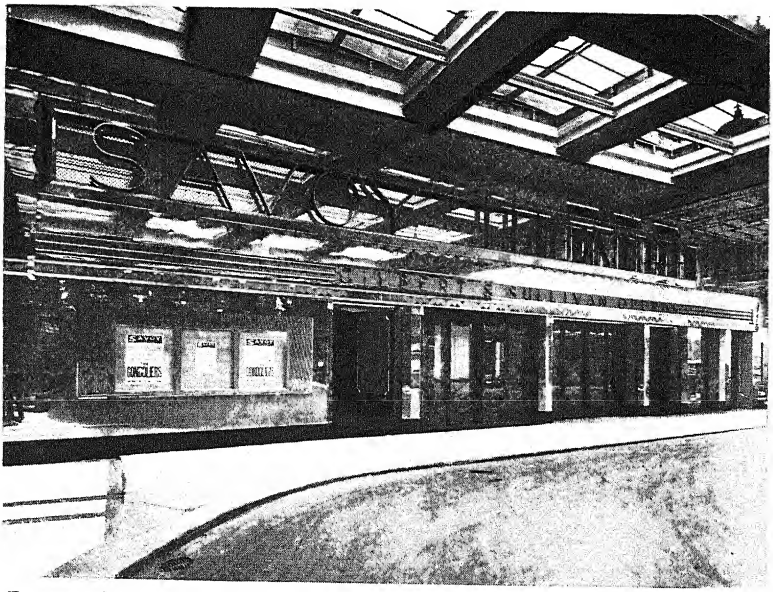

FIG. 44.—The stainless steel façade of the Savoy Theatre, London, by Stanley Hall and Easton and Robertson.

Why is a building erected? It is to meet a need. What can be more interesting and practical than an outward expression of what that need is? A direct indication of purpose is in fact, in ninety-nine cases out of a hundred, one of the requirements of the programme handed to the architect. The few cases where disguise is a requirement are purely individual, and are not of sufficient general importance to discuss.

Freedom to suggest in elevation the character of purpose is therefore desirable, and this can only be secured where structure is not too insistent. The fact, for example, that a stanchion in a particular position in a system of structure destroys the possibility of an adequate entrance to a building supplies sufficient justification for the moving of the stanchion. The logic of the stanchion's location in the original position is of much less interest to everybody than the spaciousness of the doorway.

We have seen that the effort throughout history has been to enclose space, and that a certain degree of freedom in the subdivision of space was achieved in Mediæval architecture, and we have witnessed in Renaissance times the comparative divorce of the façade from the structural elements behind it. The next step in the sequence of development would seem to be that in which buildings may ideally consist of covered and enclosed space with the greatest possible liberty in subdivision, and façades which are free agents for 'expression.'

The desire to achieve this liberty in plan and elevation lies behind modern plan design and elevational expression. The ideal to be sought in structural layout is the maximum non-interference with pure form as required for the expression of various units of the building, together with the maximum

freedom in the treatment of the envelope or façade, in order that expression may be based upon purpose and character rather than upon the mechanics of structure. The structure may become a valuable aid to the expression, but sensations of structure are in the main less important than those of character.

On the other hand, there are exceptional cases where the expression of purpose may share pride of place with, or even be subservient to, the interest of structural expression. Instances occur where engineering, which has given to architecture a freedom never before known, becomes in itself a creative element.

In the greatest epochs of the past, both the limitations and the possibilities of structure have been a source of architectural inspiration. But to-day the limitations are disappearing, and we have possibilities which are a compelling force, not only capable of meeting a demand, but even of creating it. Knowing that we can bridge vast spaces, and build towards the sky, there arises the urge to do so. Each new addition to the technique of structure creates the desire to take advantage of it.

Structure therefore stands to-day in a position of pre-eminence. It is so powerful and free that it can justifiably demand, in its larger applications, expression on its own account. But the reasons for doing so must not be confused with those which have often in the past been advanced. They are æsthetic and practical reasons, not ethical reasons.

We have heard in the past that good architecture was architecture which was honest, which 'expressed its structure.' But what is meant by honesty? Is it honest to expose stanchions, girders, and rivets to the corrosion of the

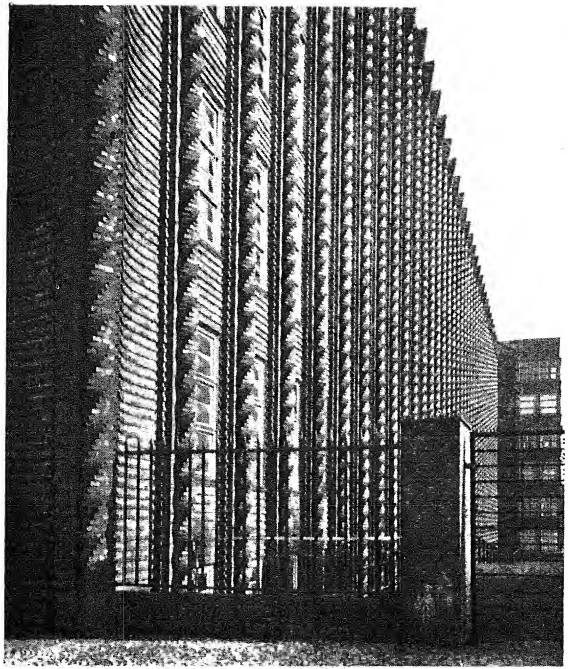

FIG. 45.—Tobacco Factory at Hamburg, by Fritz Höger, providing an example of technical bravura.

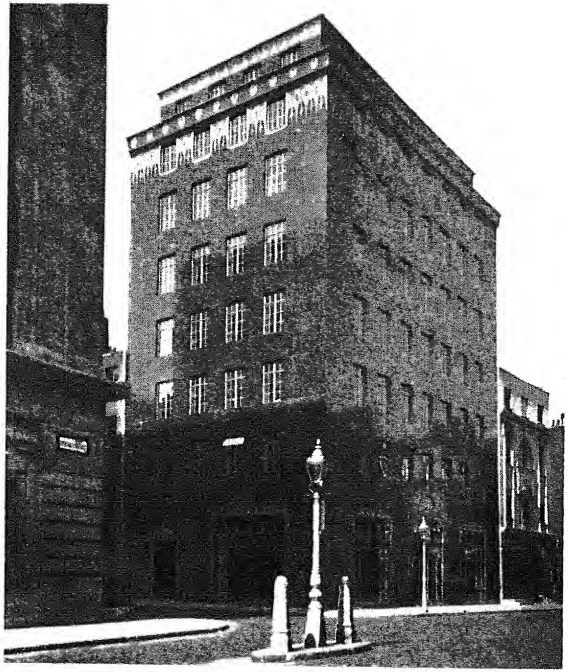

FIG. 46.—Reflections in the polished black walls of Ideal House, London, by Raymond Hood and Gordon Jeeves.

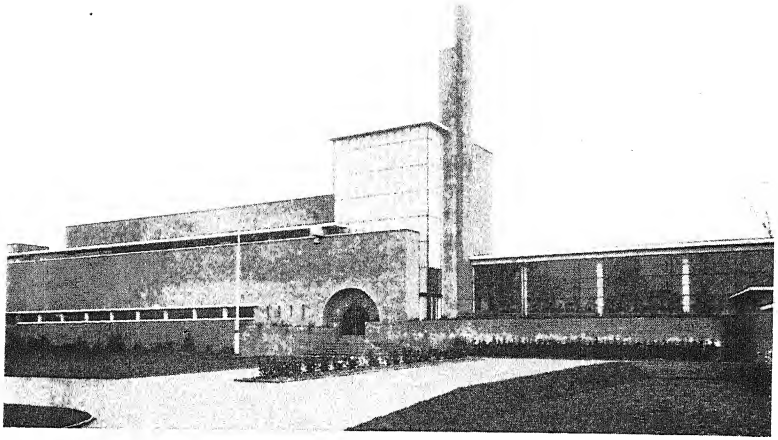

FIG. 47.—School at Hilversum, by W. M. Dudok, executed in pale yellow brick relieved by bright colours in the paintwork.

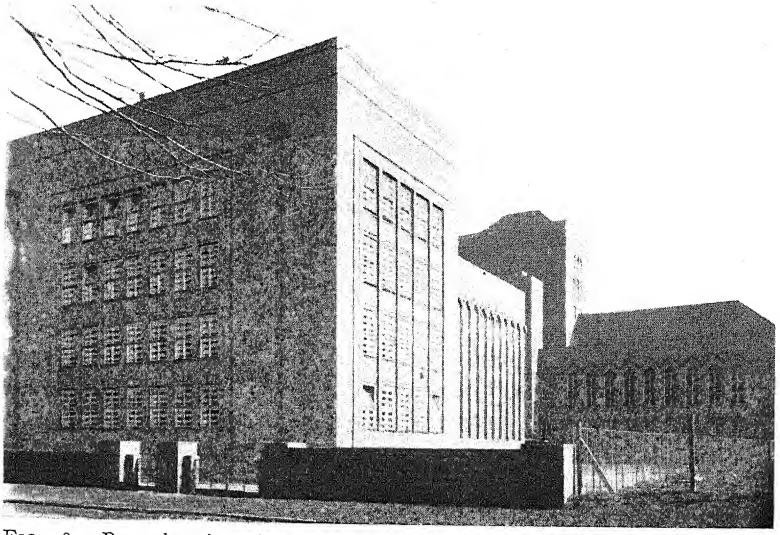

FIG. 48.—Rear elevation of a Girls' School at Hamburg by Fritz Höger, with fine wall surfaces of klinker brick.

atmosphere, for the sake of showing that they exist? Is it dishonest to clothe them in a protective veneer of stone or brick or terra-cotta, thus complying with the practical requirements of maintenance and incidentally with the building code? Is it necessary in building to show complicated details and joints, any more than it is necessary to abolish the bonnet of the motor car in order that the passer-by may see the motor and all its adjuncts? Is not honest structure that which carries its loads with safety, which does its job without claiming for its utilitarian form an æsthetic interest which it cannot always possess? The sensations of structure are not always exciting; they may even be commonplace. And why should the commonplace be glorified?

On the other hand, there is structure of an imaginative and daring nature which rises above the level of everyday performance. It intrigues or thrills, compels admiration by its ingenuity or by its daring. In such cases, æsthetically, it demands expression. To hide its wonders behind the commonplaces of applied form would be to sacrifice a vital element of interest.

So we find two categories of problem in this matter of treating structure. In solving the first, we base our solution on the assumption that the structure is not a major element of interest. In the second we regard structure as almost completely responsible for the form which the building takes, and we acknowledge our debt to it by giving it pride of place among the elements through which we build up our æsthetic effects. Structure becomes not only the biggest factor in design, but the biggest element of sensation.

Even in the latter case, it does not follow that structural elements need be exposed. They may be enclosed, hidden by decoration. But such decoration will make mute

acknowledgment of the structural form beneath, and in doing so is truly ' expressing structure.'

In the category of structure which is devoid of importance as a contributor to æsthetic sensation, we may place the commonplace structural framework of such buildings as medium-sized houses, flats, office buildings, sheds, garages, and so forth. An ordinary steel roof truss, an occasional stanchion, and the rolled steel joist over a shop front, promise no thrill. They are interesting, but relatively not more so than the wires of a piano.

When, however, the small office building of four or five storeys becomes a thousand-foot skyscraper, the mental attitude of the spectator alters. The physical daring involved in the erection of such a building captures the imagination; here is an engineering feat which compels respect. Structure so light and delicate, yet so strong and aspiring, is, one feels, worth exhibiting; let us enjoy, as we pass by, the sensations of this wonderful engineering organism.

This demand is the more urgent since, in the course of building, we may have seen the steel structure grow. Its intricate network of members, its ordered complexity which has enough of mystery to be poetic, has a beauty which, as we are well aware, will probably be lost in the finished building.

Obviously, however, the steelwork cannot remain exposed. The architect, for practical reasons, attempts to clothe it in the materials at his command, and to give to its form some suggestion of the structural vitality within. Sometimes he is successful, as in the Woolworth building, the Gothic trimmings of which are as appropriate or otherwise as any other trimmings; or as in the *Tribune* Tower,

which suggests its armature of steel. At other times he suggests his structure by line as in the 'Pan-Hellenic' Tower (Fig. 52), or by choosing forms which are typical of steel or concrete, as in the *Telegraf* offices in Stuttgart. At other times he neglects expression of structure quite frankly, and concentrates on the beehive character of the big office building, as in dozens of large office buildings in New York and Chicago. The office building in Gothenburg (Fig. 51) is a building in which both the 'beehive' character and the interest of structural lines are combined, while in Crawford's offices in High Holborn structure is emphasised as a dominant note of interest, the vertical members being treated as a decorative element by enclosure in stainless steel (Fig. 53).

A number of buildings exist in which an attempt has been made to leave the structure exposed, and to make of it a decorative element. And the least successful are those in which an attempt is made to apply a decoration and disguise the essential character of steel or concrete. Examples of this type are found in the annexe to the 'Crédit Lyonnais' (Fig. 49), in the old 'Samaritaine,' and in the Grand Palais, all in Paris. The Paris Gare d'Orsay, while its steel barrel-vaulted hall is treated with coffers reminiscent of stone or plaster, nevertheless retains the ordered lines which are suggestive of clean structure.

Where steel or concrete are shown without embellishment, possibilities of success rest on a sounder basis. But in such cases the æsthetic problem is very real, for the designer comes face to face with design in which there can be no subterfuge. The problem is one of evolving structure which is not only materially perfect, but which also in the greatest possible measure achieves beauty of form. Fortunately for both the architect and the engineer, forms

which are satisfactory from a scientific standpoint are frequently satisfactory to the eye. There is, of course, much of custom and habit in this satisfaction; for people come to accept, and even rejoice in, forms which at first shock the eye.

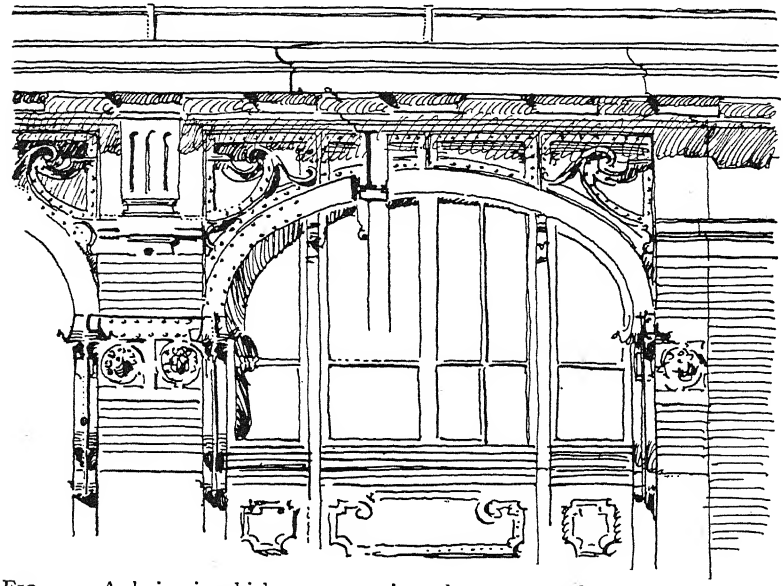

FIG. 49.—A design in which an attempt is made to treat steel structure externally as an element of decorative value. A. Narjoux, architect.

Examples of this phenomenon are found in the acceptance of the forms of the cantilever, and of the long span beam or lintel. The arch form, familiar as it is, is naturally a favourite in its suggestion of stability, but other and stranger forms, such as those employed in the Frankfurt Market Hall, soon establish themselves as reassuring. In this latter case the explanation no doubt lies in the strengthening effect of the corbelling, in the sensation that strong supports are ready to receive wide-span beams (Fig. 29, page 70).

The modern movement has encouraged the recognition

of structure, as part of the general reaction against architectural superfluities. Where economy is imposed, only the fundamental elements resist elimination. And where architectural interest is desired—and it practically always is—the form of structure inevitably receives attention. The tendency is towards frank acknowledgment of structure, and its consideration from the dual aspect of strength and æsthetic quality.

The character of present-day programmes, as distinct from those of former days, is affected by the fact that practically every element in their requirements is subject to possible alteration in accordance with the march of progress. At no time in history have methods approved and adopted in one generation been so subject to complete revision and alteration in the next.

Everything in a modern building, from the plan arrangement to the mechanical equipment, is apt to become obsolete at comparatively short notice. The ideal scheme, therefore, for every type of building except those in which requirements are almost certain to remain unchanged, is one allowing the greatest flexibility in arrangement and possibility of revision. Permanent and rigid subdivisions of space in consequence become undesirable; the ideal plan is one so laid out that as many practicable variations of internal division as possible can be arranged within the enclosing walls. And the ideal façade is one in which such alterations of internal economy do not necessitate remodelling of the elevations. The ideal method of construction would be one in which all internal walls are independent of those above and below, and are so many temporary or semi-permanent screens easily dismantled should alterations in the internal organisation demand it.

This ideal has been achieved to a varying degree in office buildings and commercial premises. But it might be extended to embrace many types of buildings, such as town halls and municipal offices, in which there is frequently too much 'architecture,' too much stress on the right adjustment of elements of structure and internal walling in the effort to obtain a neat and clean plan pattern, which is often achieved only by ingenious juggling. A single alteration to accommodation might make the whole plan pattern unworkable unless a sacrifice were made of the symmetry which was the keynote of the scheme.

With the development of a modern outlook and technique, it is probable that much greater stress will be laid on the establishment of a general plan framework, within which accommodation may be varied with reasonable ease. If a less rigid conception of the plan were established, and became a matter of policy in public as well as in commercial buildings, structure could be lighter, design simpler, and the whole conception of expensive 'architectural' façades might be revised.

Permanence can nowadays easily be exaggerated, and even public authorities might well consider possibilities of changes in their working accommodation and equipment, and offer the problem to be solved by the architectural profession. Once the ideal of flexibility were adopted, in accordance with the mechanical means which structure now offers for its realisation, engineers and specialists, not to mention architects, would soon work out the technique of this new type of design organisation. Public building programmes would be amplified to embrace the possible needs of the next ten or twenty years in each category of building, and the architect would attack his problem on new lines of thought.

FIG. 50.—The Tietz store building in Berlin where architecture and engineering met; a comparatively early and very bold attempt to create the all-glass façade. Sehring, architect.

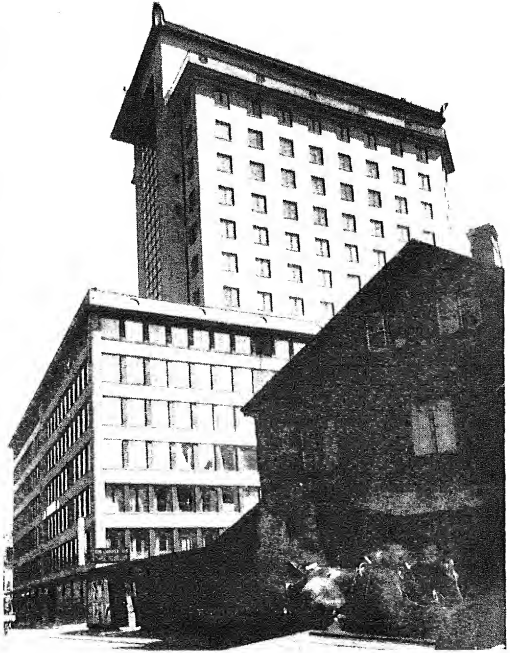

FIG. 51.—An office building in Gothenburg, modern in form and detail, yet definitely Swedish in character.

FIG. 52.—The Pan-Hellenic Tower, a New York Hotel for women university graduates, by John Mead Howells. The structure is expressed by sensations of direction in form, but the solidity of the modelling is typical of transitional research towards the ultimate solution of the problem of clothing skeleton structure.

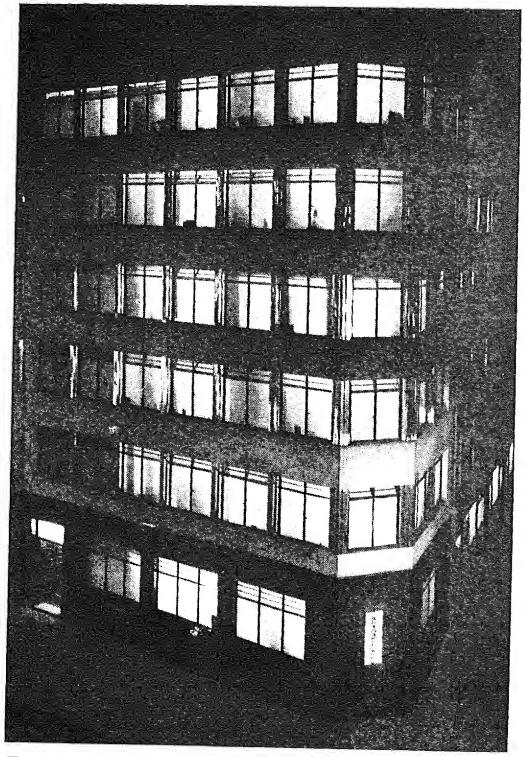

FIG. 53.—Crawford's Building in Holborn, by Herbert Welch and Frederick Etchells, with a rendered façade relieved by piers of stainless steel.

The present-day ideal of planning the most compact and closely-fitted building, with the greatest possible number of permanently located axial lines, and façades in which certain features, such as masonry columns and piers, often preclude a rationally flexible fenestration, would disappear. A different type of architecture would result, one from which certain elements familiar and even dear to the public heart would be banished. But, the first shock overcome, the improvement in internal arrangements, and in particular the economic advantages, would soon become popular; in fact the disappearance of the stereotyped design for town halls and offices would be a loss to no one.

In respect of domestic work, it is clear that under present conditions the same need for flexibility does not exist. Very few people are contemplating the shifting of the internal economy of their houses in accord with new ideas or even to meet the needs of growing or diminishing families. The programme being different, the same methods would not apply.

But even in domestic buildings there may be provision for limited extension; quite a number of people, under the present régime of economy, build with future additions in mind. The architect can provide for these where circumstances permit; and the flat-roofed house, with its structure calculated to take a possible future storey, is especially well adapted to extension.

It has been necessary to discuss the basic possibilities of the present-day situation in design and structure generally, before returning to the question of expression, since this is so largely controlled by the conception of the plan and its suitability to purpose.

Granted comparative freedom from structural control,

the architect still has to contend with various elements which greatly influence the design of his 'envelope.' Perhaps the most important of these are the voids, which share with the solids the honour of forming the principal element in the façade.

The voids of a building are generally glazed. Their function is to admit light, to isolate the interior from weather and noise, and generally—but not necessarily—to provide a means of ventilation.

The designer has, very frequently, the main proportions of his façades determined for him, by the dimensions of the site as regards length and breadth, by the building regulations as regards height, and by the accommodation requirements in general. He may therefore consider the elements of solid and void which lie within the façade area so determined.

The form of the voids will be governed by the service which they are to perform. The lighting aspect must be considered, the proportion and placing in relation to internal spaces to be illuminated. The construction and material must be calculated in view of insulation (*e.g.* the heavy fixed plate glass windows of the new Lloyds Bank in Cornhill, which effectively shut out the roar of city traffic from the rooms within), and, finally, methods of opening for ventilation and cleaning must be examined. The function of the void constitutes, therefore, a complete study in itself.

The question of the shape of windows, of the horizontal *versus* the vertical, has been argued from both the æsthetic and humanistic standpoint. It is averred, in respect of the latter, that man is a vertical being and prefers in consequence to look out through a vertical opening, echoing his own 'direction,' upon the world beyond. For the horizontal

window, it is argued that it offers the maximum surface of glass area between the ceiling and that height of window sill which is generally accepted as desirable and practical for individual types of buildings. The third alternative is the all-glass front, but even this, in most cases, would be interrupted for at least the normal floor thicknesses at the level of its different storeys (Fig. 50).

Architects are not apparently in agreement on the question of fenestration treatment; it is difficult to see how this can be otherwise, considering the varying types of building problem, and the fact that even in those of one category the conditions of site, and other factors, vary to an infinite degree. We have only to take one example, the department store for example, to see how greatly treatments vary.

The Bon Marché extension in Paris, for instance, has large voids treated in a modern, but not a 'modernistic,' manner; that is to say there is no extreme emphasis on the expression of the fenestration (Fig. 54). The architect of the new 'Samaritaine' in Paris fills the void between piers with glass and metal, but expresses the location of the floors (Fig. 57). In the Schocken shop at Breslau by Erich Mendelsohn the voids are carried continuously along the façade, in a horizontal banding, and no expression of the structural piers is attempted (Fig. 56). In the Schocken shop at Chemnitz by the same architect a continuous window band alternates with a fairly wide head-to-sill band; but in the Schocken shop at Stuttgart, previously illustrated (Fig. 39, page 92) the fenestration is treated as a banding of small units with definite mullions between them. The Bijenkorf shop at the Hague, on the other hand, has huge windows which are planted on the wall face and embrace several storeys. These are of opaque glass, and actually the internal fitting of the shop

does not take much account of these potential sources of natural light (Fig. 55).

It seems impossible to argue with finality the pros and cons of these various types, since the requirements of each establishment may differ, the *de luxe* shop and the popular shop, the general store and the specialist store. Many owners will prefer wall space to windows, and the gaiety of artificial light which is so favourable to many classes of goods. Others will hold diametrically opposite views.

The architect is therefore left with his type of fenestration treatment to be decided on the grounds of its appropriateness, or else he rides roughshod over fitness for the sake of general expression of character. Whether this is legitimate or not again largely depends on whether the value of the expression derived justifies, from a practical standpoint, any sacrifices involved.

Whether his windows be large or small, vertical or horizontal, the architect has in this case one definite problem in expression to face, which is to make his building look like a shop. His façades have to proclaim not only 'shop,' but shop of such and such a character.

Expression of purpose is, however, largely a matter of custom and convention. Most Americans know that the Greek temple on the corner in every medium-sized town is a Bank or Trust Company. Why? Because the use of that temple motive has become a symbol for stability and trustworthiness, qualities with which financial houses like to have their names associated.

The architect who is designing a shop has no such clear-cut convention to assist him. All he can do is to study those characteristics of expression in existing shops in various cities and countries which seem to be held in common, and

FIG. 54.—The Bon Marché annexe, Paris, by L. H. Boileau.

FIG. 55.—The Bijenkorf shop, the Hague, by Paul Kramer.

FIG. 56.—Metal, glass, and Travertine in the Schocken shop at Breslau, by Erich Mendelsohn.

FIG. 57.—The new Samaritaine, Paris, by Jourdain and Sauvage.

conclude that, since they are so frequently found in buildings of that class, they must be part of a generally acceptable convention as to the qualities which a shop design should embody. Characterisation is largely established on conventions, and these, though not absolutely defined, cannot be defied with impunity beyond certain limits. The architect who seeks a new expression in shop design therefore runs a risk. If, producing an original and fresh design, his building is still unmistakably recognisable as a shop, he has succeeded. But if his message is not sufficiently clear to be read—and that at a very rapid glance—and his shop is mistaken for a block of flats, he will generally be considered to have failed. A knowledge of current conventions, of style and fashion, of the prevailing tendency, is therefore essential to the modern architect. For, under present conditions expression is so divorced from the structural limitations which act as a prop to the timid designer, that the architect becomes practically a decorator on a large scale. He is at one and the same time a fashion designer, and an expressionist of the spirit of his age (Fig. 58).

Fashions in architectural design are not unmitigated evils. They lend variety to the streets of cities, and are a healthy sign of an æsthetic interest constantly maintained and freshened by new ideas.

To connect for a moment the questions of fashion and fenestration, there may be said to be a mode at the present time for horizontal windows and horizontal glazing in them. The horizontal motif may perhaps arise from a certain sense of horizontal movement in everyday life—rapid transit, a constant outward growth, a movement to include in one's orbit distant things and places. A sense of amplitude is conveyed by long horizontal sweeps; and this is in remote,

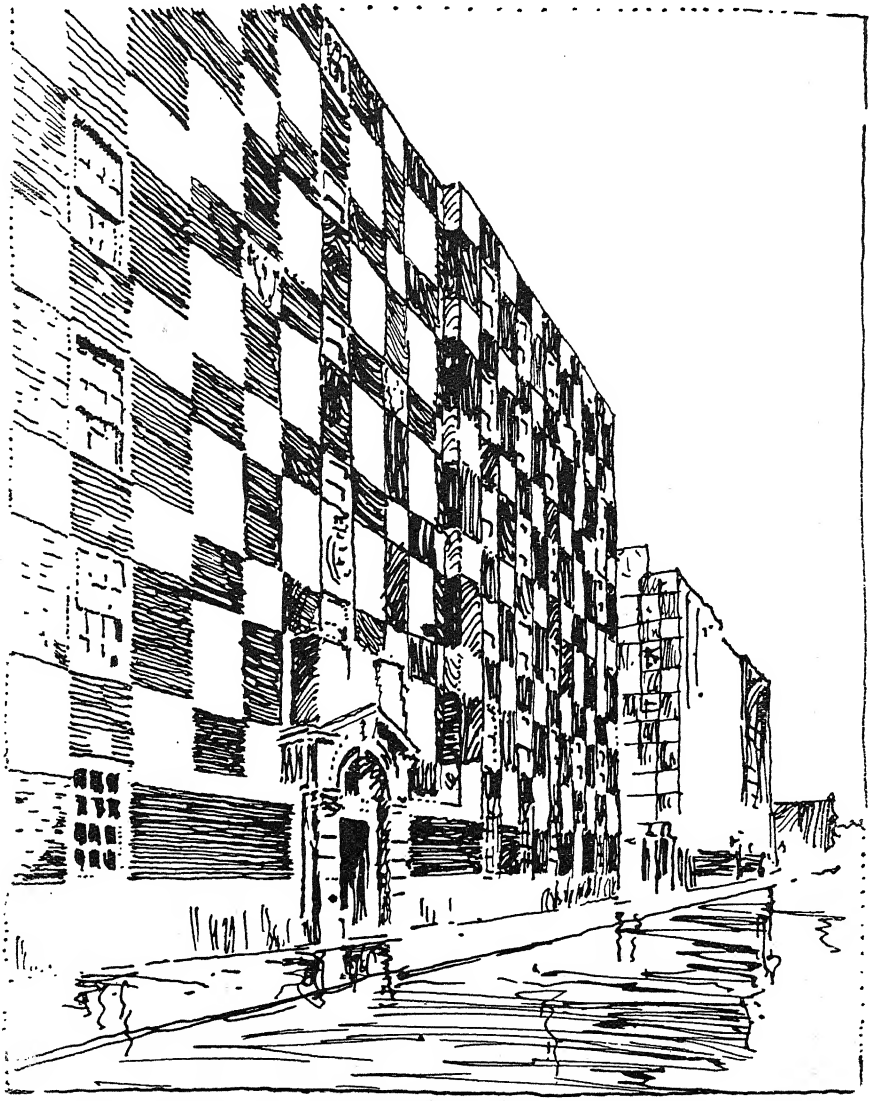

FIG. 58.—The Grosvenor Housing Scheme, Millbank, by Sir Edwin Lutyens, R.A., with brick and plaster chequer pattern into which the windows enter as an element.

but nevertheless definite, accord with the presence on the modern mental horizon of big ideas and wider understanding (Fig. 59).

In the same way, continuous vertical lines have their architectural devotees. They soar, they suggest unchecked and swift movement; above all, in the same way as long horizontals, they convey the impression of continuity, and hence of unity. Unity of impression, completeness in the fundamental basic effect, is one of the ideals of the modern designer (Fig. 60).

The use of both continuous horizontals and verticals assist definition in design. But so also does the third popular method in fenestration, that of regular pattern. By this is meant even rhythm of solid and void in which these elements act, in respect of each other, much as do the squares on a chequer board. The general scheme is devoid of accentuation in the window treatment, strongly projecting sills and heads are banished, and an even reticulation is spread over the bulk of the façade. The value of this system is seen in designs where it is desirable for practical reasons (*e.g.* the presence of numerous internal divisions, as in an apartment house) that glazing should be interrupted by solids, but where a maximum of glass surface is also a requirement. To meet this need, closely spaced windows are required; yet the intervening solid wall surfaces must not appear too thin. So the designer uses the pattern method, whereby a diagonal direction is implied as well as directions of height and length. The wall and window surfaces become in this way a weaving, which, though tenuous, has strength because of the multiplicity and constant crossing of its threads.

A good instance of this method applied to a large surface —always a problem on account of the need for a suggestion

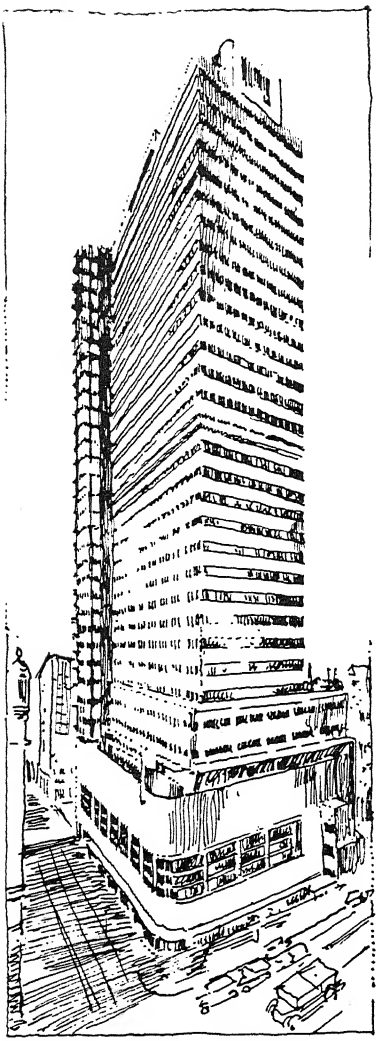

FIG. 59.—Preliminary design for the Philadelphia Saving Fund Society Building, by Howe and Lescaze, with an all-horizontal banding.

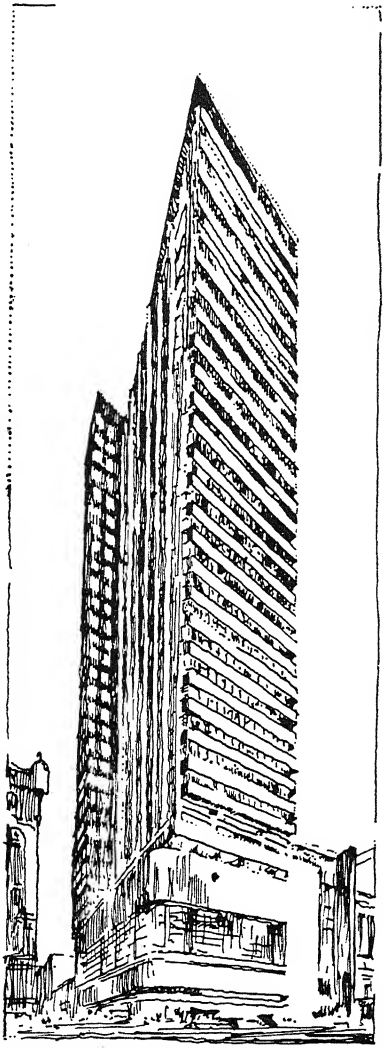

FIG. 60.—A study of the revised design, in which, for structural reasons, both horizontal and vertical lines are found in combination.

of strength to accord with bold dimensions—occurs in the 'Sprinkenhof' offices in Hamburg, by Höger & Gerson. Here the fenestration pattern, through practical necessity, is carried close to the edges of the façade, but the designers have overcome the danger of weak angles by overlaying the wall and window pattern with a brick reticulation which acts in much the same way, from the visual 'support' point of view, as the lattice members of a girder. This effect is accentuated by raised 'paterae' which further increase the sensation of pattern, and by the placing of the whole upper mass of the building on its base much in the way that a box is placed upon a stand, that is to say, without connecting links between the two. The whole upper part appears therefore as a solid patterned 'chunk' of material, and the supports of the base are cleverly brought out at the junction in the form of a cushion, increasing the sensation of repose and solidity (Fig. 61). A façade such as this, while it may not appeal either as regards character or taste, presents many points of knowledgeable design; and a similar claim may be made in respect of a great deal of modern work designed by architects who bring analytical reasoning to bear upon many of the current problems which are met with in all types of buildings.

Another device for achieving strength, where large voids are required, is that—frequently practised in modern Dutch work, and also found in the new 'Empire State Building' in New York—of placing the window glazing flush with, if not actually in advance of, the wall surface (Fig. 62). Wall and window are brought into the same plane, no reveals are present to break up the surfaces, and where the window frame projects the same sensation of strength is produced as that which resides in the familiar 'fielded panel.' Convexity

of surface suggests strength, concavity is apt to produce a reverse effect; though this is mitigated in the case of fenestration by ample depth of reveals, which remind the spectator that the wall, though pierced, is one of considerable thickness and strength. It is almost impossible, however, to obtain adequate effects of strength by this means in very tall buildings; in the ' Empire State ' Building, for instance, 4″ or 8″ reveals would have had no strength value, though these depths are all that the structural system would allow.

Reveals play an extremely important part in design of other elements besides windows, but fenestration dominates most designs to such an extent that the architect should force himself to work with shadows and in perspective, and also where feasible with models on which materials are indicated.

One important point to be remembered with regard to window design is the fact that the placing of large glass areas close to the external wall face may effect considerable economies of internal space. Glass is one of the *thinnest* materials which can keep out weather and act as a thermal insulator. Therefore, when it extends to the floor, it replaces the usual wall below sill level, and this wall, by virtue of its materials (and the requirements of the law), is very much thicker than glass. So space is saved here, and if the glass is set forward as far as possible, full advantage of this economy is taken. In the ' Empire State ' Building, hundreds of square feet were added to the floor areas by considering this point in design. And when this addition is measured in terms of rent in dollars per square foot, the architects' ingenuity and forethought begin to figure as a flash of business genius.

Among other elements of importance in expression are

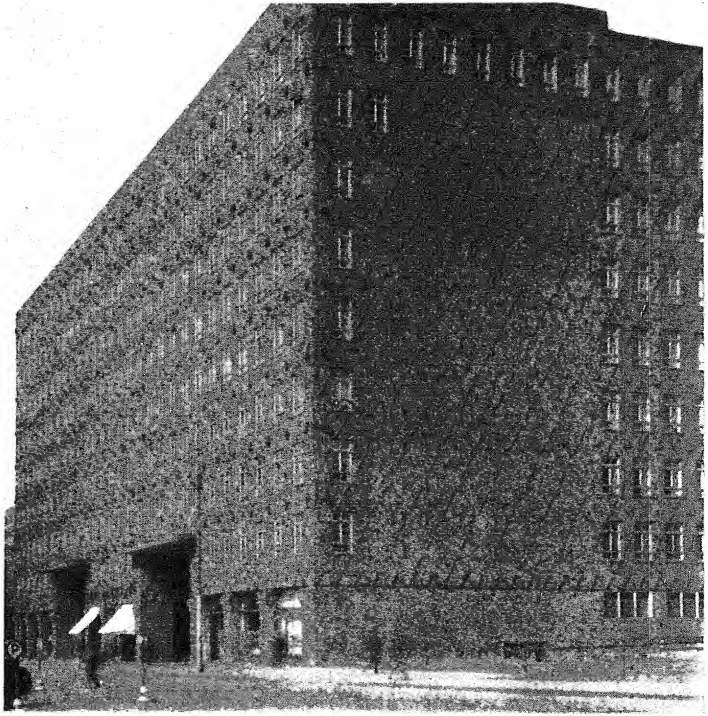

FIG. 61.—The Sprinkenhof, in Hamburg, by Höger and Gerson.

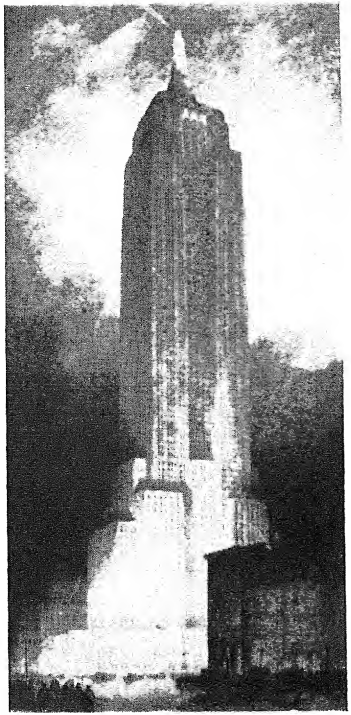

FIG. 62.—The Empire State Building, by Shreve, Lamb, and Harmon.

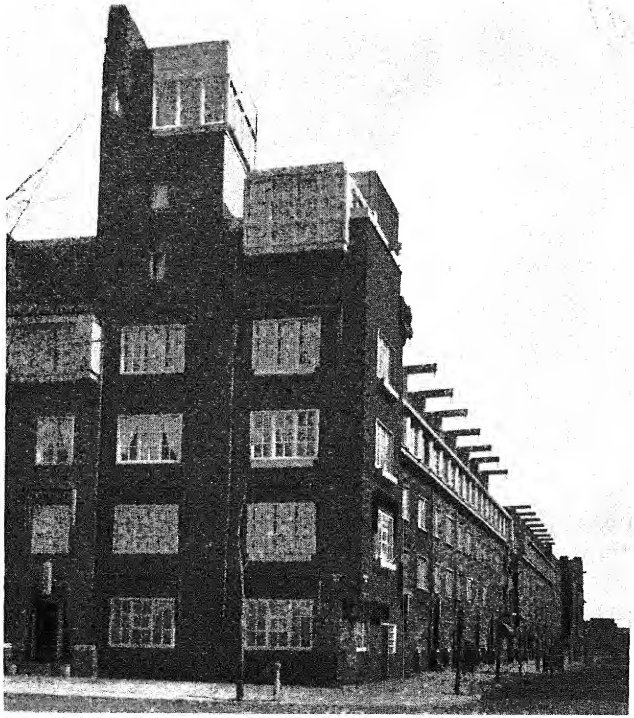

FIG. 63.—Modern street façades in Amsterdam, conceived in broad masses, gain vitality and interest through projecting elements.

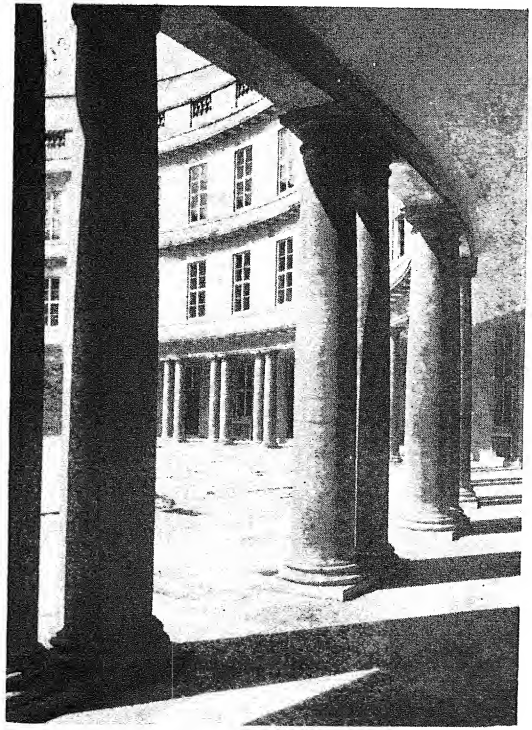

FIG. 64.—The Courtyard of the Police Court Headquarters in Copenhagen, by Kampmann, Rafn, Jacobsen, and Kampmann.

façade projections. Streets nowadays are often narrow in proportion to building height, and the spectator is apt to enjoy an almost worm's-eye view of details. To an extent never before realised, therefore, the soffits or undersides of all reveals and projections become important. Many architects study their façades in pure elevation. They never imagine themselves as looking *up*, and as seeing the effect of profiles and contours against the sky. Yet here is a most valuable element in design, and one which is not unduly expensive to manipulate. For soffits can be decorated broadly and effectively without intricate detail—which is generally lost as it is viewed against the light—and their outer edges can be modelled to produce original effects of playful form, which render their full return in reality, though on an elevational drawing they are invisible (Fig. 63).

The fact that they *are* invisible is one of the reasons why modern design is so difficult to convey in competition drawings; for much of its effect depends upon subtle texture, discreet use of materials, and soffit design. The assessor who is unfamiliar with modern aims simply does not grasp these things, which can scarcely be conveyed in line elevations.[1]

Projections have their practical uses. And though cornices are at present somewhat out of fashion, they do undoubtedly protect wall surfaces, in spite of Le Corbusier's suggestion that their protection extends to such a limited depth that they are scarcely worth while. On stucco fronts an overhang has a particularly useful function in avoiding staining; and sills and drips generally cannot with impunity be dispensed with, as an examination of some smooth white

[1] The remedy, no doubt, is to allow competitors to submit the usual minimum of drawings, together with others which appear necessary to explain their design. For even in draughtsmanship conventions the modern outlook seeks a new expression.

modern fronts, in cities especially, reveals. A small point is that of the design of sills, which even when strongly weathered outwards from end to end, allow a staining drip at their junction with the wall. The formation of a raised ledge on the sides of sills, on their outer edge, might obviate this trouble.

These, however, are matters of detail. The real task of the designer is to use his knowledge of certain aids to effect, and of practical details, to lend to his design distinction of character and an expressive physiognomy.

Physiognomy is a guide to character in human beings and in architecture. Certain forms and lines convey an impression of character or quality in the human countenance, and so do lines and forms in architectural design.

Arched eyebrows give to the human expression an air of interrogation, or surprise, sometimes of superciliousness or aristocratic aloofness. Arched openings, at the top of a façade, frequently convey a similar impression. Square shapes, strong rigid lines, imply firmness, as do also bold projections. Wavy lines, delicate reeded profiles, suggest grace and elegance, as do slender proportions in general. The human countenance is an excellent guide in respect of the reactions of form on expression of character, and the architect has a whole fund of observation on humanity to assist him. But he must have previously visualised the particular stamp of impression which he wishes his façade to convey to the spectator.

The judicious selection of types of form is not alone sufficient to convey an impression of character. What dominates in design, more than anything else, is the *quality* of shape. And the most important element in quality of shape is proportion.

One of the wisest remarks ever made about proportion was that of Bacon, who said that 'There is no excellent beauty without strangeness in the proportion.'

This is quite true; a proportion, to be significant, must be a little strange. It must be ever so slightly exaggerated, it must escape the obvious. The little variations from the obvious are the hallmark of personality. A proportion may be correct, without being interesting; and the architect's business is to make proportions interesting.

The stressing of proportion provides the key to character: witness the tall narrow lancets of a church, the wide spans of a railway station arch, the attenuation of a column. Not only the choice of units, but their relationship to each other, have an important bearing on character. Sometimes, characterisation involves the breaking of 'rules.' For instance, the proportions in the stone Courtyard of the Copenhagen Police Courts are contrary to generally accepted principles. There are equalities here, in the matter of heights, which are generally avoided. But in this case the equalities in height of the two storeys above the colonnade are probably intended to decrease the eye-interest in the vertical proportions in favour of the dominant characteristic of the courtyard, which is its circular form. This vertical proportioning is undoubtedly calculated for a certain effect; it avoids 'rightness' because a certain monotony—even deadness—was required to emphasise the even rhythm and monotony of the colonnade below; and it is this monotony which contributes to the sensation of steadiness produced by the stone circular form with its unity of shape completed by a stone paving. The necessary relief to monotony is given here by light and shade, occurring in the depths of the colonnade and in the projections of the cornices (Fig. 64).

A similar instance of proportions, which according to usual standards, are perverse, even 'wrong,' is found in the arcade of the Gothenburg Art Museum, in which the voids of the tall arches are practically similar in width to the piers between them. This is an unusual system of spacing to adopt according to 'rules,' but here it provides the keynote to the whole character, which is that of an aloof and reticent simplicity. The design is not classic, nor yet modern; but it is by no means negative in character. It avoids being negative through the fact that the façade is based upon one motif, that of the arcade, and because in the proportioning of this arcading resides a subtle suggestion of 'strangeness.' Although every detail in this façade is drawn from the occident, its 'physiognomy' contains a piquant trace of oriental inscrutability. And so the Gothenburg Museum arrests and holds attention (Fig. 66).

Generally speaking, a façade in which but few themes are developed, and those very strongly, is the most satisfactory in expression. The eye is incapable of grasping, and relating, a great number of separate themes; and the achievement of some broad effect which governs the design is half the battle in design, because it imbues the composition with basic strength. Herein lies one explanation for the success of continuous motifs such as colonnades, or even applied orders, which in many types of modern building have no other *raison d'être*.

An application of this principle of determined unity of effect is made in the new office building for *The Daily Telegraph* in Fleet Street, designed by Elcock & Sutcliffe in association with Sir John Burnet & Partners (Fig. 71, p. 148).

The façade of this building is composed in its main elements of a large frame, backed by a 'field'; and within

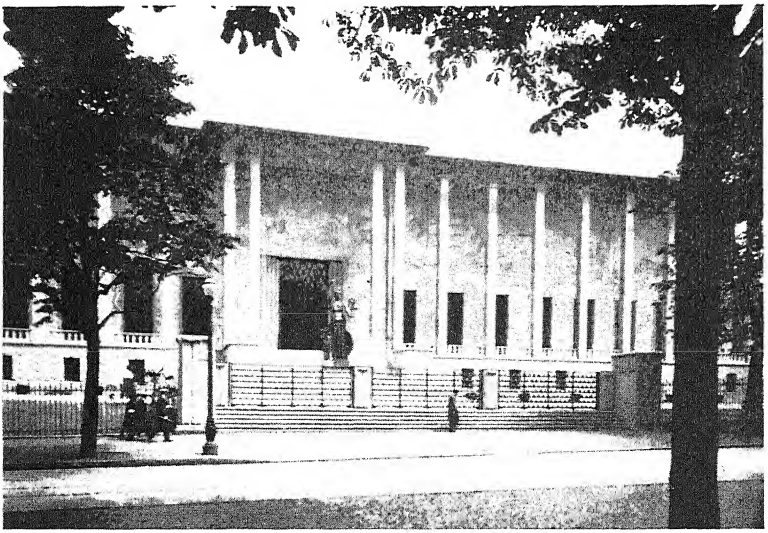

FIG. 65.—Successful expression of purpose. The façade of the Musée Permanent at the Paris Colonial Exhibition of 1931, by Jaussely and Laprade.

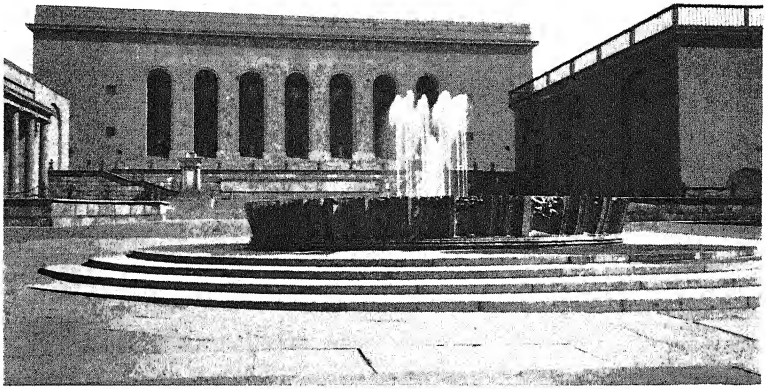

FIG. 66.—The Gothenburg Art Museum, designed by a panel of Swedish architects.

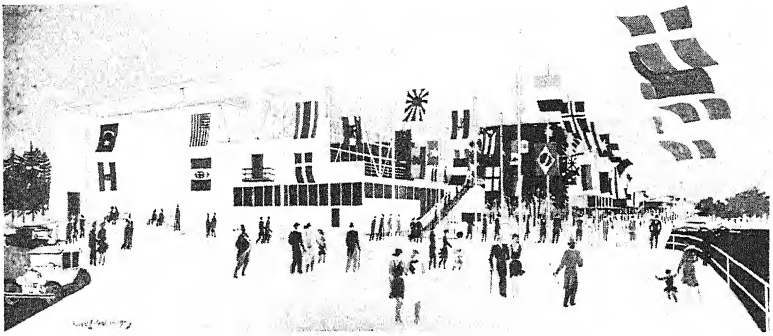

FIG. 67.—A study of the Entrance to the Stockholm Exhibition of 1930. Gunnar Asplund, architect.

FIG. 68.—The Swedish Pavilion at the Paris Exhibition of Decorative Arts (1925), by Carl Bergsten.

this frame is contained the principal design interest, based upon a series of six bold fluted columns silhouetted against the glass and metal screen which forms the outer wall within this area. As much play of light and shade, as much movement and suggestion of power as possible, are concentrated within this central panel, while the field which provides the background is made subservient. The sensation of a strong containing margin, which is implied in the frame—in reality a vast ' architrave '—is emphasised by an accompaniment of wavy lines which also effect a transition from the frame to its supporting field.

This motif of the frame is one which many architects have employed at various periods since the days of ancient Egypt. It owes its popularity to the opportunity which it affords for suggesting strength and achieving unity of effect by simple means. In many ways it is not completely satisfactory, for it is basically a small motif, and when used on a large scale is apt to produce an effect of coarseness; nevertheless, it has its uses in cases where it is desired to produce an effect of unity by simple and direct means.

The solution of all problems of the expression of materials, structure, and purpose are intimately related to questions of architectural feeling which to-day form the basis of strong differences of opinion between the right, centre, and left wings of architectural thought. The right wing is conservative; the left wing is that of the *avant-garde*. In it are found the pioneers of the ' new ' architecture, the extremists, the revolutionaries; and also some of the most stimulating thinkers amongst present-day designers.

The point chiefly at issue is that of architectural expression, involving a determination of the principles which should govern the character of design. Architects of all

three wings are agreed on certain desiderata, such as efficient planning, sound construction, a practical use of materials, and expression of purpose. But as regards interpretation there is wide divergence of opinion.

The quarrel between 'traditionalists' and 'moderns' arises largely through the discontent of the latter with the restraint believed to be imposed on practical and efficient building through a too prolonged subservience to traditional architectural motifs. The traditionalists would adapt the old language of architecture to express new thoughts. The moderns would like to scrap a good many old-fashioned phrases and usages, and at the same time enlarge the vocabulary which is inadequate to voice certain twentieth-century thoughts. The left wing of the moderns would like to see a return to basic principles, to architecture which is pure in form and derived entirely from fitness for purpose. The creed is that of 'functionalism.'

There is a difference between the ideals of the moderate modern and those of the extreme functionalists. In the one case the designer is not only concerned with designing functionally, but is also preoccupied with æsthetic pleasure, and sets out quite frankly to procure it; the modern does not necessarily disdain fine materials, veined marbles, the rich figures of veneer, and the subtle curvatures which please the eye. Like the traditionalist, he appreciates these things, and believes them necessary. But he would prefer to realise them, for the enjoyment of his contemporaries, in a twentieth-century idiom.

The functionalist, in theory at any rate, seeks in design only the most effective expression of the *use* of any object, whether it be a house to live in, or a chair to sit on. Technically, the object must be perfect, and nationalism, indivi-

dualism, temperament, personal caprice, do not enter into the question. Perfection in service is to be realised, and it is an international quality; the personality of the designer must be sunk in the effort to satisfy the needs of humanity not on a local, but on a universal basis.

This theory, to be valid, presupposes agreement on functional standards, and on technique. Carried to a logical conclusion, however, it would take no account of what may be called ' mental functionalism,' *i.e.* the satisfaction of the mental, as opposed to the material, demands which the designer is called upon to meet.

If, for instance, one imagines a chair which is perfectly designed for comfort, but which is nevertheless so deficient in æsthetic charm that its owner takes no joy in sitting in it, but prefers to patronise some less perfect but more sympathetic piece of furniture, then that chair is not a complete success. Its functionalism is defective.

A similar defect might exist in a perfectly habitable house, which is full of light and space and well-regulated equipment. But if the ' atmosphere ' of that house is wrong, or is thoroughly out of tune with the owner, his friends, and his friends' friends, the house *quâ* home will be a failure. ' But,' it may be argued, ' the house is probably right, it is the owner and his friends who are wrong. Let them but become accustomed to it and they will eventually learn to love it.' That is an argument based on a hypothesis of optimism, which might as well be one of pessimism. The truth is that a design, if it is to be functional, must not only serve, but please; a design is not truly functional if it is necessary, as a preliminary step, to remodel completely the tastes and habits of the person for whom it is prepared.

Extremes meet. And there is more similarity of aims

between the *avant-garde* and the mere 'moderns' than is apparent. The latter are conscious in their efforts to charm the eye: the former are ascetic in their elimination of any satisfactions which do not arise directly from the nature of the problem. Nevertheless, almost instinctively, they seek to please. The cult of form and line, the play of light on volumes, the emphasis of direction, all bear witness to a subconscious effort on the part of the designer to attract. But he does so by stressing fundamentals rather than accessories.

In this fact lies the appeal of the lean, austere modern work which is expressive of an engineering efficiency and economy in design, and pleases because its effects are based upon such vital things as structure and purpose, and not upon association or reminiscence.

The functionalists, as seekers after basic 'truth' in architecture, are on the right path. Their exaggerations are signals of the reaction, necessary in all fundamental movements, against the abuses of an unsatisfactory system. Gradually, however, their work will be humanised; which is to say that it will contain a recognition of the truth that in art there is a place for the superfluous, for the little touch of unnecessary fancy or even of luxury, which is precious, because it is not strictly material.

The Stockholm Exhibition of 1930 has been termed an exhibition of functionalism. The design of its buildings was entirely subordinated to their purpose. But this 'purpose' embraced many aspects: conformity to site, suitability for the display of exhibits, ease of circulation and control, and lastly, but by no means least, appeal to the eye. Sentiment was banished from the buildings; new methods and materials were suggested in their design. But colour,

light, the gay banners of orange, blue, yellow, were not banished. These were the elements of eye pleasure—of sentiment. The aim of this exhibition, as of past exhibitions, was to attract. Success in this direction was one of the tests of its functionalism. So, after all, the aim was unchanged; only the expression of the aim, the plane on which the appeal was made, was different. This plane, in the case of Stockholm 1930, was a lofty one, the appeal was of a basic nature. And therein lay the spiritual virtue of an exhibition which materially was devoted to the vitalising of modern Swedish home arts and industries (Fig. 67).

Successful architectural expression along the basic lines of functionalism requires the highest degree of design technique, for to be of real significance it must be pure. Based, as it is, on a clear and efficient statement of necessity, it involves structural knowledge and imagination of the highest order, a profound knowledge of the properties of materials, the greatest skill in the treatment of pure form. No applications of ornament, no eye trickery, are present to assist the architect in covering up his sins of composition; no sentimental attributes can distract attention from failure where pure volumes of geometric form are the basis of expression.

In modern design, 'functionalistic' or otherwise, the structure is expressed through its elements. But these do not necessarily appear, as was formerly the case in nearly all old work, in the form of visible elements of support which are incorporated in the façade or envelope. The continuous plate-glass window on the ground floor of a shop was formerly condemned: 'Show the supports, and do not carry your façade on plate glass.' But nowadays, where a cantilever system of construction is employed, it would be

false to show supports on elevation, where they do not actually occur; the structural elements are all contained *within* the envelope, and there is no logical call to show them. The design may be none the less sound for all that, and already the eye has come to accept this expression of modern structure almost without question. The strength is there, but it is more implied than visible, and consequently modern buildings of this structural type are apt to reveal in elevation a justifiable quality of lightness, even of fragility.

This latter quality, which at first shocked architects and public alike, has now come to be accepted and even welcomed so much so, that the suggestion of fragility is sometimes sought for its own sake, on account of the pleasure which it gives (Fig. 78, page 159). This pleasure is derived, in the first place, from the satisfaction derived from lightness as contributory to elegance, and secondly from the almost subconscious satisfaction of realising that behind the appearance of fragility is strength—based on sound engineering calculations. Very light elements, in juxtaposition with powerful elements, produce these sensations in an enhanced degree, and consequently architects are drawn towards what may at times appear to be ill-assorted combinations, such as sheets of polished plate glass set in walls with the slightest possible frames of metal, or without frames at all. The contrast of the polished plate with the rougher wall is piquant. The interposition of a heavy frame would suggest strength; but it would do it so directly and crudely that the effect might not be in harmony with the rest of a façade ensemble in which structure had been consistently implied and not actually revealed.

An instance of this occurs in one of Dudok's schools at Hilversum, where the architect actually bedded single sheets

of plate glass in the brickwork. The effect was very attractive in a rather perverse way, because both brick and glass had qualities of surface, and the intervention of a wide frame would have interfered with a tense appreciation of their widely contrasting characteristics. For practical reasons, this method was abandoned. But the metal frame which was subsequently introduced was almost entirely hidden behind the brick reveal, so that the original effect was maintained.

These are design subtleties which have a similar value to that produced in sensitive phrasing in words or music. They appear as irrational or inexplicable only to those who fail to grasp, or are out of sympathy with, the type of expression which is being sought.

The suggestion of concealed structure is sometimes responsible for a note of phantasy in form and detail which is not uncommon in modern design, and is enriching it in much the same way as the gnome carved on a Gothic corbel enriched the sense of Gothic structure. Everyone knows that the little figure in its quaint cramped position gives no effective support to arch or beam, but that, by imbuing structure with humour, it makes the latter all the more interesting and human.

A modern parallel occurs in another of Dudok's schools at Hilversum, where one corner of a wide roof overhang is made to appear as though supported on a large round ball. The ball suggests the act of playing with the load, it offers itself as a jest in the face of the solemn necessities of structure (Fig. 69).

The setting back of wall surfaces in the form of a long narrow band, just below the point where some load or weight is taken by the wall, is another device expressive of

'reserve strength.' It seems illogical: for just where the load occurs, there one would expect, not diminution, but extra thickness. But, in employing it, the designer is suggesting that his wall has strength enough, and to spare. His setting back, with its sharp shadow, corresponds to the gesture of a man who is so sure of his strength that he can afford not to display it.

At times, in modern work, structure takes control of the conception and governs it, much as it did in Greek or Mediæval times. A good instance occurs in the curious concrete church of Elisabethville, in France, designed by Paul Tournon (Fig. 73).

This church is entirely built of concrete, and its expression is based on the structural elements and the way in which the material is handled. The framework consists of a series of piers, which are carried up above the roof and connected by cross beams, thus forming what amounts to a series of rectangular hoops. From this structural skeleton the vaulted ceiling is suspended, while concrete beams at eaves and aisle roof levels help to support respectively the vault and the aisle roofs with their lanterns, and at the same time connect the series of concrete 'hoops' in the longitudinal sense. Here is a curious reversal of the flying buttress system, quite as structural, and occupying far less ground space. It is a perfectly logical arrangement in this instance, and has the advantage of heightening the lines of the exterior and relieving the skyline from the aridity which sometimes characterises flat-roofed buildings.

An example of quite another type occurs in the Siemens-Schuckert works near Berlin, where the magnificent plain mass of brickwork is relieved by a series of tall vertical strips which enclose the steel stanchions of the framework.

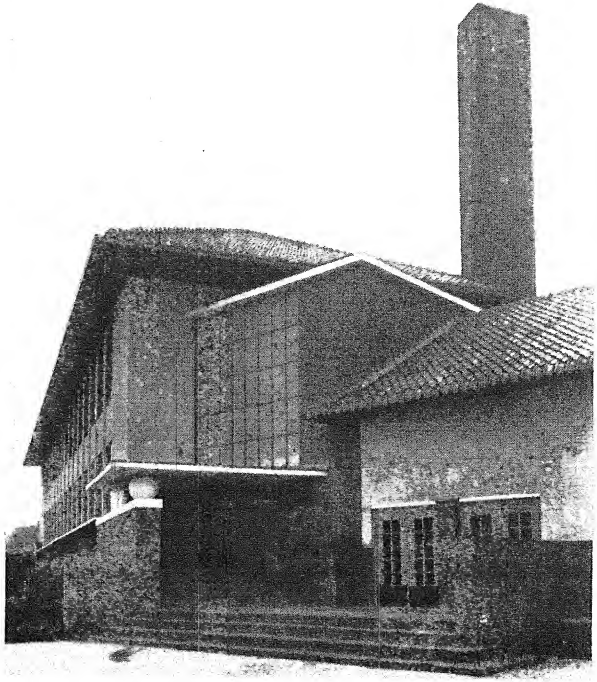

FIG. 69.—Entrance to a School at Hilversum. W. M. Dudok, architect.

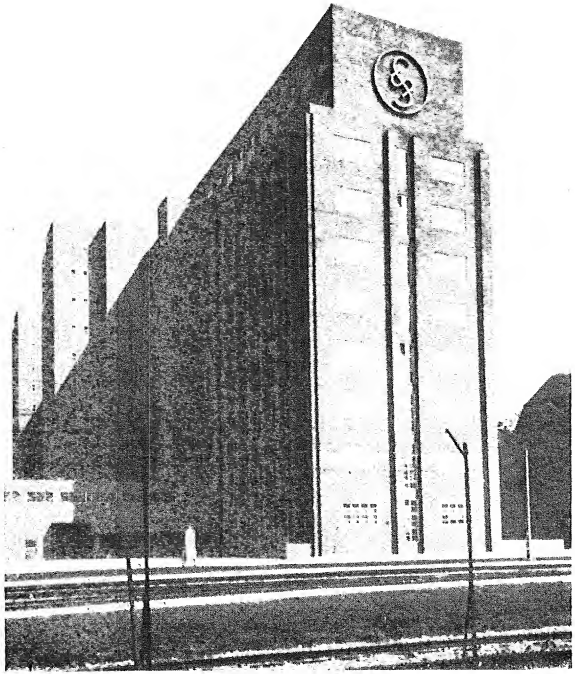

FIG. 70.—The Siemens-Schukert works at Berlin, by Hans Hertlein.

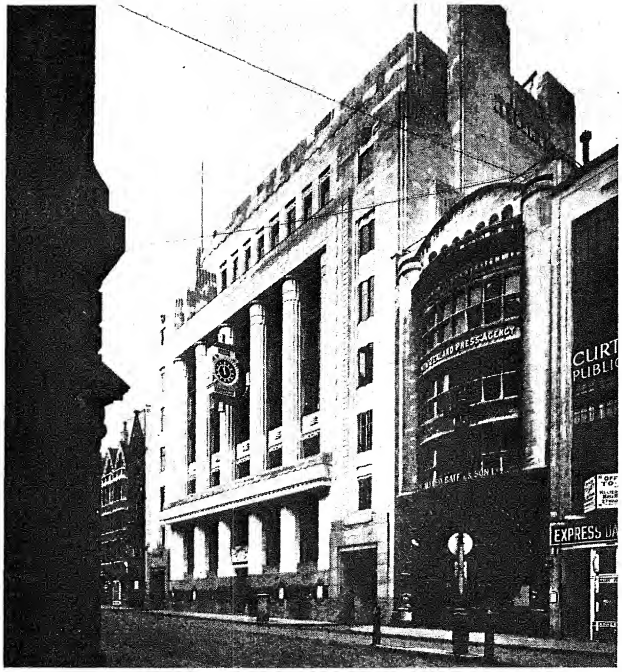

FIG. 71.—The 'Daily Telegraph' Offices in Fleet Street, by Elcock and Sutcliffe, and Sir John Burnet and Partners.

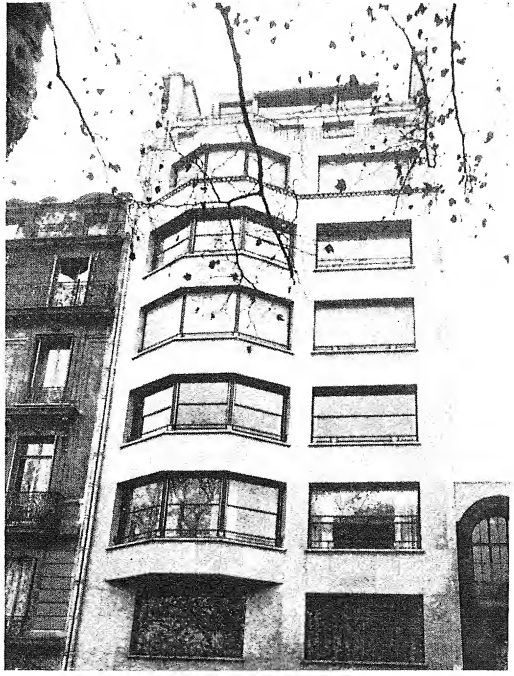

FIG. 72.—Flats in the rue Guynemeyer, Paris, by Michel Roux-Spitz. The construction is of reinforced concrete, the facing of Hauteville stone, and the geared sash windows are of bronze.

These appear as structural elements frankly displayed, and form at the same time the principal decorative motif. Their

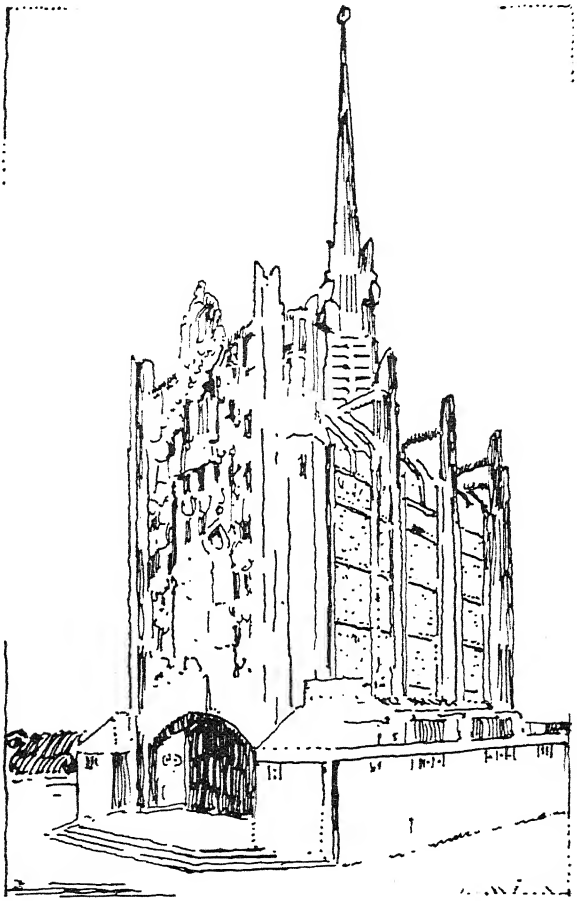

FIG. 73.—Sketch perspective of the concrete church at Elisabethville, France. Paul Tournon, architect.

appearance on the exterior is justified also on practical grounds, for by placing them externally the internal faces of

the envelope are left smooth and unbroken except by window and door openings (Fig. 70).

Another interesting new industrial building, the Van Nelle Factory in Rotterdam, has cantilevered walls of steel and glass behind which the structural piers are clearly visible. Expression here is not only structural, but characteristic of function, and the whole design is vitalised by its imaginative form and general composition (Fig. 75).

Unfortunately—or fortunately—there are no real recipes for success in architectural expression. Any composition, however sound its basis, can be deadened in execution. And conversely, many a poor dead thing will come to life at the touch of an artist. As Tolstoy has said, ' No instruction can make a dancer catch the infinitely minute centre of his note, or a sketcher draw of all possible lines the only right one, or a poet find the only meet arrangement of the only suitable words. All this is found only by feeling.'

V

External Details

No amount of careful detailing, or clever ' embellishment,' will save a poorly-proportioned elevation from its sins. But details, when they are used to develop character by putting upon it the stamp of complete finish, have a value much greater than is realised in these days of commercial reproduction.

One can travel for miles in parts of London, and in most other big English cities, without seeing a single detail of ornament which is really worth noting in a sketch book. Ideas exist only in modest quantity; and distinction and refinement in their presentation are appallingly rare. The vast majority of buildings would be better for a clean shave of all their slipshod applied details.

One reason for this is lack of imagination on the designer's part. This itself is largely brought about by constant stylistic reproduction, and the lack of encouragement which is offered to fresh invention. The same old motifs serve over and over again, so much so that churches, cinemas, banks and shops may all be ' embellished ' with the same attributes.

Yet there are many entirely novel features in modern design which suggest handling in a fresh way as regards their detail; and there are vast untapped reservoirs of pattern and ornament for those who need to seek direct inspiration from existing models. Generally speaking, the average architect's vocabulary seems to be stocked almost exclusively from the Renaissance storehouse. There are half

a dozen currently applied moulding enrichments, three or four pattern devices based on the use of compasses and set squares, and perhaps a dozen motifs of free carving—scrolls, acroteria, urns, swags, lions' heads, caducées, rosettes, etc. The bulk of the motifs used are executed mechanically, without any vigour of line or vitality in modelling. Yet the possibilities of quite conventional pattern are very wide, provided that sensitiveness of composition and feeling for line enter into their design. Modern Swedish architectural detail of the best type provides examples of what can be achieved when every line is rendered expressive and made to convey the same sensations of character which are sought in the design as a whole.

Even 'stock' elements, such as column bases and capitals of classic origin, may be imbued with a fresh character (*vide* Fig. 68, page 138). The shape and proportions of an Ionic cap, for example, are dictated by a sense of fitness and eye pleasure. The long cushion of the cap, parallel to the direction of the entablature, is expressive of an Order 'in antis'; the volutes, structurally superfluous, lend to function the elegance of an expressive and luxurious flourish. But there is no reason why the Ionic cap form should not be remodelled in any desired 'flavour,' provided that the character of the building warrants a departure from generally accepted models.

The experiment is supposed to be a dangerous one to make, but this is merely because of the prevalent lack of design skill, and not because variations on well-known themes are wicked. To be successful, however, the architect or sculptor must be sensitively aware of the properties and uses of each member of that cap; and scholarship has too long been content with compilation of data, in which the analysis of the origins of design are lost sight of. There

FIG. 74.—Bas-relief on the façade of the Folies-Bergère Theatre, Paris, by the sculptor Pico.

FIG. 75.—The Van Nelle Factory in Rotterdam, by Brinkman and Van der Vlugt.

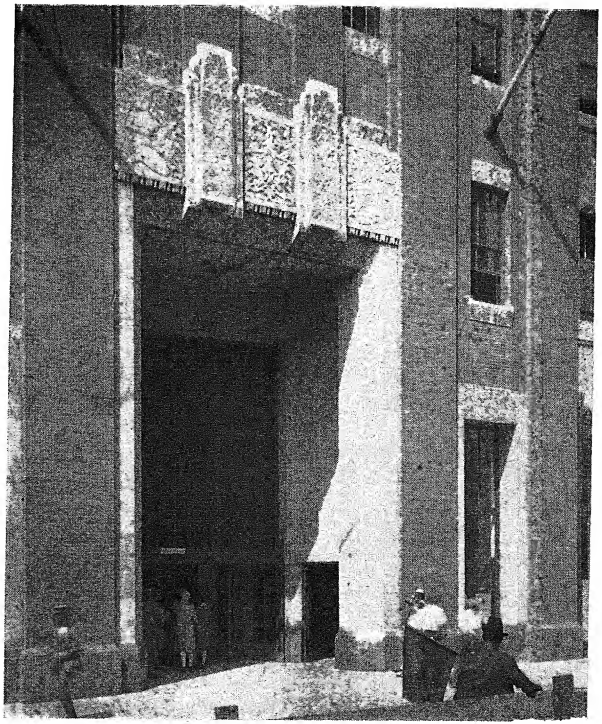

FIG. 76.—A detail of the New York Barclay Vesey Telephone Building, by McKenzie, Voorhees, and Gmelin.

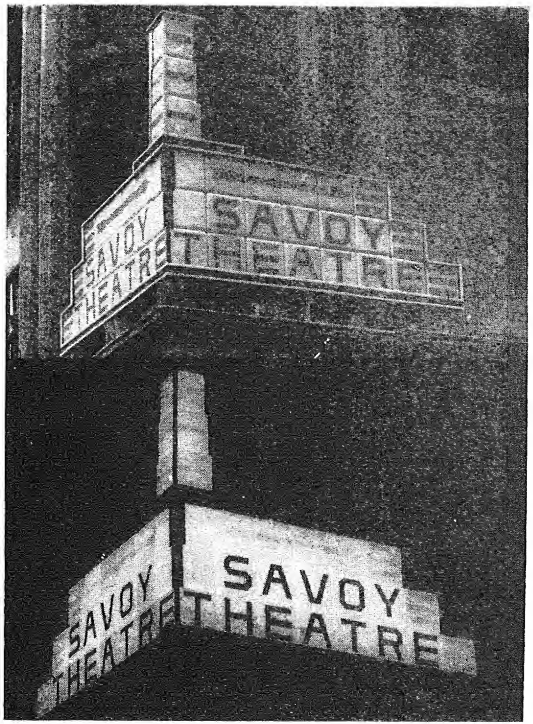

FIG. 77.—Day and night views of a sign constructed of glass cubes. Designed by J. Murray Easton and Howard Robertson.

is much familiarity to-day with traditional elements of all kinds, but little general understanding of their basic meaning, and consequently of their proper application.

The proper approach to all matters of detail is similar to that adopted in major problems in design. First an analysis of the requirements, to establish the necessity or otherwise of any particular detail; and then a study of the form which it should take in order to fulfil the function which it is to perform. Every moulding, fillet, or enrichment should be established with the thought of its purpose constantly in mind. Ornament, free or contained, must perform in mass and line a service which is quite clearly defined in the architect's mind. A great deal of ornament is termed 'meaningless.' It may be so because its general character has no particular relationship to the type of building on which it is placed; but a more serious criticism is the lack of its significance in relationship to the general scheme of the design.

The categories of modern buildings are too numerous to permit a detailed examination of present failings and neglected possibilities in matters of external detail. It may suffice to mention a few of the details which in current practice are ill-designed, with a consequent loss to architectural interest out of all proportion to the effort which would be required to remedy their deficiencies.

Examples of detail in which weakness is exhibited are the profiling and enrichment of mouldings of all sorts, from the cornice down to the most humble architrave. The factor of possible interest latent in these familiar elements is nearly always overlooked, and though the egg-and-dart no longer figures in the casting of humble sanitary fittings, it still does yeoman service in far too many fields. Yet in Romanesque,

Byzantine, Gothic, and especially in English Norman work, are many delightful themes which could be applied. Norman detail, with its sharp clear-cut pattern, its rhythmic emphasis, is peculiarly suited to form a basis for a modern repertoire, as a study of, say, Durham Cathedral or Romsey Abbey will show; and Byzantine and Romanesque sources, which so greatly attracted the late Bertram Grosvenor Goodhue, have happily inspired other modern American designers, a good instance being found in the New York Telephone Building of McKenzie, Voorhees & Gmelin (Fig. 76).

Turning to larger elements, we may note the poverty of the treatment of metal windows and infillings which are so frequently employed in the modern screen-wall type of design. There are innumerable instances in London of buildings with elaborate and carefully-studied classic detail, in which the metal infilling is both trite and poverty-stricken in design. The architect has sources of ' inspiration ' for his masonry elements; but in the metal work he and the manufacturer have to combine forces in a field of fresh invention. The result, in ninety per cent. of instances, is disappointing. Again, old-time sash and casement windows, in their glazing, and in the proportioning and profiling of their members, provided one of the great elements of design interest; but the modern substitute, the metal window, has not been refined by an equal amount of study. For example, the metal sashes made in America are practically exact replicas, in size and detail, of wooden windows. But the possibilities of elegance in a metal sash window, when really designed with respect for its possibilities, are hinted at in such buildings as the apartment house in the rue Guynemeyer in Paris, designed by Roux-Spitz. These windows are of

bronze, operated by gearing, and are glazed with plate glass. Their proportions are unusually wide, and thus they proclaim not only their function as transmitters of light, but also recognition of the resources of modern manufacturing technique (Fig. 72, page 148).

In the realm of the metal worker are the majority of the 'marquises' which in London it is the privilege of the owners of certain types of building to provide as shelters for their entrances. These shelters offer fine scope for the designer, yet there are scarcely more than half a dozen in the whole of London that are worth while noting. Particularly is the lack of interest evident in the new cinemas and theatres, where more or less stock types of treatment are used on façades, in other parts of which the architect has made an effort to introduce some sort of special character. Yet the shelter is generally the most visible element of all, and serves not only as a protection to patrons, but as an advertisement. It merits, therefore, full use of the range of materials available, and particularly of the lighting effects which are possible even in the limited depth of two feet which the London authorities impose. French and German designers have tackled this problem rather more thoroughly, the chief criticism being that workmanship and practicability frequently fall below the standard of the ideas incorporated.

Ease of maintenance, even distribution of illumination, provision for the attractive display of interchangeable lettering, are problems encountered in most shelter designs. But shelters with electric lighting placed between a ceiling of glass and a glass roof—which is fairly common practice—are difficult of upkeep, and the upper side of the glass ceiling is apt, in London particularly, to get dirty very quickly. To overcome such difficulties, which are well

recognised by both architects and manufacturers, is part of the designer's arduous task. Yet little progress is made in the solution of these current problems.

The external lighting of buildings, though increasingly popular, is generally in a backward state, and proper provision for illuminated signs, advertisement panels, and the accentuation of architectural features at night is rarely considered in a comprehensive way. And yet, in many categories of buildings, night-effects are just as important as day-effects, and the architect should therefore study his nighttime values as well as his normal light and shade. The façades of amusement buildings in particular might be transformed, if their design were touched by imagination, into charming illuminated pictures, to the great improvement of streets and to the delight of a public which is eager to appreciate illumination, but which is seldom offered any but the most commonplace examples of its use.

Some of the architectural possibilities in the matter of exterior lighting lie in the illumination of 'reveals' of openings, in the silhouetting of features by 'halo' effects—in which the source of light is hidden behind elements which are thrown into relief against brightly illuminated surfaces—and in an extended use of decorative lighting by gaseous tube. Care and collaboration with the technician are required in all details of design for light effects, as, for instance, in the neat disposal of the electrodes in signs of the Neon type.

Of recent years many interesting suggestions for light effects have been introduced, examples of which are cubes of light which can be assembled together without any exposed metal fixing to form a veritable glass wall of changing colours (Fig. 77), and also signs built up in sculpturesque

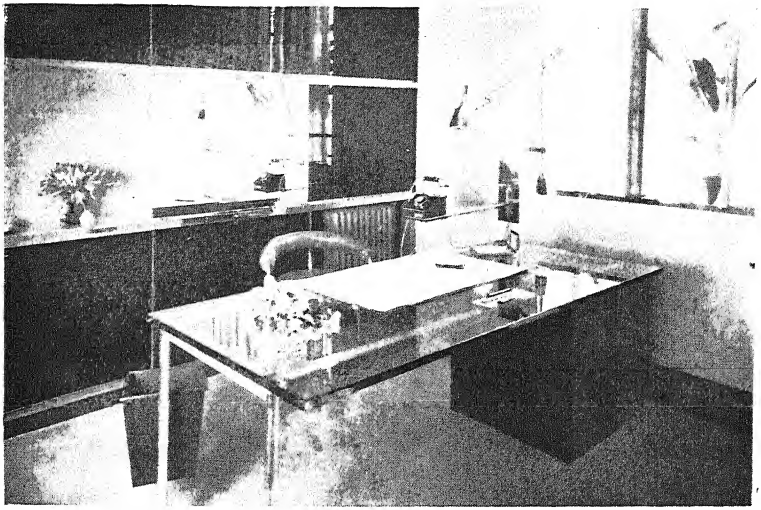

FIG. 78.—An office of the 'Semaine à Paris,' by Le Corbusier and Jeanneret, and Charlotte Perriand.

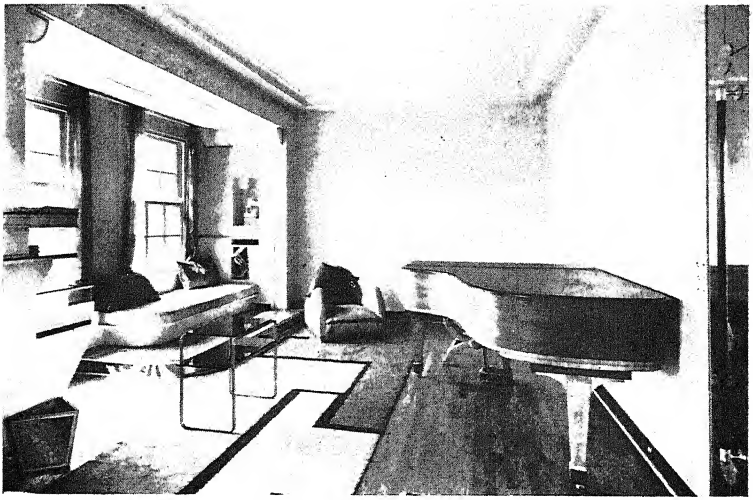

FIG. 79.—Transformation of an existing interior into a scheme of modern character. J. Murray Easton and Howard Robertson, architects.

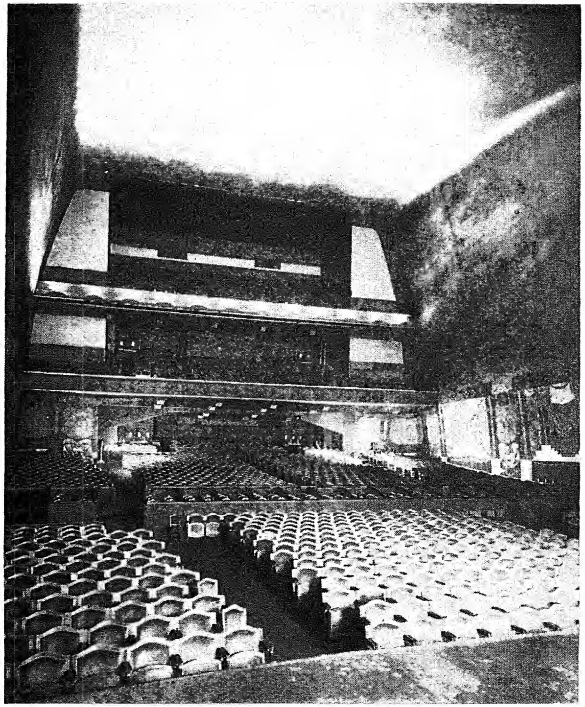

FIG. 80.—The interior of the Salle Pleyel, Paris, by Auburtin, Mathon and Granet. Its form is wholly dictated by considerations of good visibility and acoustics.

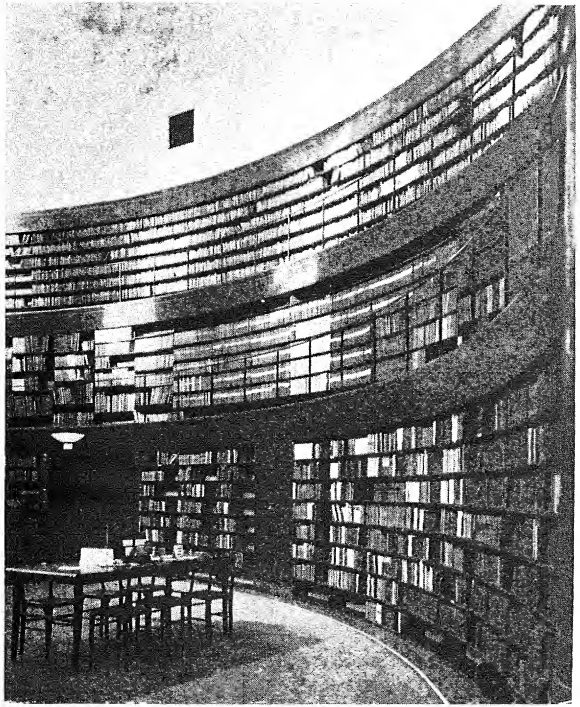

FIG. 81.—The circular interior of the main Reading Room of the Stockholm Library, by Gunnar Asplund.

form such as the large glass and metal tiger, designed by 'Stransigns,' which was recently supplied to a firm in Singapore for use as an advertisement (Fig. 100, page 202). This particular sign offers suggestion for effects which can be decorative both by day and night; and so also, in quite another way, does the charming Neon sign of Atkinson's scent shop in Bond Street, designed by Norman Wilkinson, which represents a hanging basket of conventionalised flowers.

It is becoming increasingly apparent that the façades of certain types of commercial building might be considered as backgrounds for display effects. Posters, properly designed, are charming things, as many modern designs show; but poster principles applied to buildings are generally a complete afterthought, and it is rare to find any large decorative theme of the poster type whole-heartedly and permanently incorporated in the design. The amusing centre panel of the Folies-Bergère Theatre in Paris gives an inkling of what might be done in this direction (Fig. 74, page 153).

Modern detailing is obviously only in its infancy. It is far in arrears of the broad expression of structure and character, and neither client nor architect seem to have even dimly realised the possibilities which are open when once there is established a mutual willingness to throw off the incubus of conventional details which no longer have any significance in their application to a vast majority of modern types of buildings.

VI

Interior Decoration

THE field of interior decoration is frequently assumed to be one into which any amateur with cultivated taste and a feeling for design may enter with confidence, without having first to undergo the long and strenuous training which is recognised as a preliminary to architecture proper. Yet no assumption could be more ill-founded.

For decoration is merely one department of the treatment of space, and is indissolubly linked with the study of form and architectural composition. It is true that in much 'decorator's work' the form already exists, and decoration is limited to embellishing it. But even this cannot be satisfactorily managed without an appreciation of the properties of these existing forms, and without a technical knowledge of building, since the bulk of decoration work involves alterations to structure (Fig. 79).

For internal decoration to have its full expressive value, it is necessary to consider it from the outset as part and parcel of the space-enclosing elements. A vision of the complete final effect to be obtained is necessary at the time when the lines of bare walls, floors, ceilings and openings are being conceived. Only in this way can all the elements which enter into decoration, from floor finishes to illumination, make their full contribution, for each and every element has its reaction on form itself, and the modifications to form necessary for the achievement of a final effect must be constantly borne in mind.

The composition of a decorative scheme embraces the consideration of each element, large and small, which enters into it, and covers a field which may include: (1) General purposes and scope; (2) Elements and materials of structural form; walls, floors, ceilings, windows, doors; (3) Elements of heating and lighting; radiators, floor, wall, or ceiling panels, fireplaces, sources of direct or concealed lighting and power; (4) Elements of utility; treatment of wall, floor and ceiling, coverings and finishings, furnishings, upholstery; (5) Elements of eye pleasure; colour, modelling, detail, either as permanent or mobile features of the scheme.

In the handling of all these factors intervenes the question of personal taste and sympathies. Provided that a decorative scheme be ' good of its type '—and this presupposes a certain suitability to purpose—there is no set standard by which it can be approved or condemned. The interior is a more personal and intimate section of architectural design than the exterior. The latter offers to the public eye an envelope which to an extent must be impersonal, having regard to the sentiment generally existing that a certain degree of restraint in the expression of feeling or mood in public is desirable. But the interior, from the public hall down to the most secluded apartment of a private house, is a more intimate thing, expressive of some particular character, personality, or sentiment, according to its particular use in occupation. In its more public attributions, it may be designed to serve and please a limited number of people who enter it with the knowledge that its atmosphere is dictated by its allotment to a specific purpose (Fig. 88, page 176); in other words, the designer of the interior sets out to cater for a given clientèle. But in its most intimate phases of private use, the interior is designed as the background

and ambiance of the individual; it is destined primarily for the uses of one person. And the function of its designer is, first and foremost, to satisfy that individual, provided that he can do so without violence to his convictions.

If pure Art is the communication of the artist's experience, decoration in its usually accepted sense does not constitute pure Art. The designer does not stand alone in the matter of decorative treatment, unless he be given an absolutely free hand. The communication of his 'experience' is modified by external factors, such as the obligation to interpret requirements, either definitely formulated or implied.

It is difficult, therefore, to consider interior decoration from the standpoint of logic alone. Many people, for instance, consider that it is absurd to design nowadays an 'Elizabethan' Hall. But if a Hall of that type be demanded by the client, the architect is bound to supply it unless his conscience revolts at the task. Whether such revolt be justified, or not, is a matter for discussion. A great deal depends on what is required from decoration, on whether the demand is for an expression of present-day life, of what is typically basic in the modern outlook, or for a piece of purely scenic *décor* which will create—as in the theatre—an atmosphere of illusion.

A contributor to one of the architectural journals recently presented an illustration of a large modern cinema decorated in the Tudor style, with a proscenium opening suggesting a castle doorway with raised portcullis, and accompanied it by a note containing a mild gibe at its incongruity. But it is difficult to see why such a treatment is more incongruous than, say, an 'atmospheric' interior, with imitation Spanish buildings and foliage silhouetted against an electri-

cally-lit sky. Both types represent merely a *décor* provided to amuse the public and to give to it a sense of well-being in exchange for a cash consideration.

Arguments for and against Period or Modern work are not on a very secure basis, unless it can be shown that one or the other type is specially indicated by a given set of conditions. Some people are thoroughly unhappy in a modern setting, others are rendered miserable by pastiche of Louis XV or Queen Anne. Logic is on the side of the Moderns, because purely reproduction work makes no real contribution to progress in art or commerce, and because there is a basic harmony established between all things which are an expression of twentieth-century ideals and experience. Yet at the same time there is no practical or ethical reason why individual tastes should not be preserved and indulged, why people who desire to live their home life against an eighteenth-century—or any other—background should not be permitted to do so (Fig. 83, page 170). Pure functionalism as a basis for decoration, entailing the suppression of individual taste and idiosyncrasies, might possibly lead to a phase of decorative art more sincere and vital. But its universal adoption presupposes conditions of uniformity which do not exist at present and are only remotely probable in the future.

In any case, the gifted designer, even if working in a Period style, will quite unconsciously enrich his creations by gifts from his own store of artistry; for his natural experience can never be quite similar to that of a designer living in the period which is being reproduced, and consequently the expression can never be quite the same. The real drawback to 'Period' work in general lies in the temptation to indulge in pure reproduction work consisting of a mere

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assemblage of features; in such cases the decoration of a room becomes an effort in exact copyism, and is not vitalised by the designer's contribution, as would be the case if it were conceived merely *à la manière de.*

Successful interior work in either 'Period' or 'Modern' demands understanding: in the latter case, of the basis of the modern movement; in the former, of the basic attributes of style character. Both make heavy demands on the designer, and in both there are the same openings for spurious work without any basis of idea. In the case of modern work, the result may be deplorable; for in the 'trickiness' of certain features of modernism lies a great danger, and an assemblage of most of the tricks, divorced from a background of reason and sincerity, presents one of the most unpleasant spectacles that the field of decorative art can offer.

The danger is not limited to the school of mere 'modernism,' from which there is already a distinct tendency to break away in favour of that 'functionalism' of which architects like Le Corbusier and Jeanneret in France, and Walter Gropius in Germany, are the chief exponents. Functionalism, the production of design on a basis of rational service to needs, is an ideal which is not particularly new. It formed part of the creed of William Morris, and of men like Eastlake, who produced uncouth designs which were nevertheless conceived on a sound reasoned basis of theory. The chief difference seems to be that nowadays the functional article is not considered to be true to its type unless it be susceptible of commercial reproduction. But it cannot be admitted that even were an article to be serviceable, structural, economical, and commercial, it would necessarily be pleasing. To do so would be to revive the

old fallacy of 'efficiency = beauty,' which is nowadays generally considered to be exploded.

The element of insincerity may easily enter into 'functionalism,' as into other types of expression. The operating-room of a hospital is functional; as a piece of clean design it can—if one can forget its associations—be visually and intellectually quite attractive. Clean, glistening, with its smooth walls in soft tones, its polished steel and plate glass, it has the mechanistic beauty of a yacht or an aeroplane. To take the 'operating-theatre style,' and adapt it to an artist's studio, is possible; in fact, it is being done. The result is pleasant, in so much as the clean lines of mechanism are being introduced; and it is also 'amusing,' because the effect is fresh and unusual. But let us not confuse 'amusing' and 'intriguing' effects with the principles of functionalism. If the steel chair is not a better, and if possible a cheaper chair, than a wooden one, and we still use it, it is not because it is more functional (*i.e.* logical and rational), but because we like it better. And why, supposing that its joints loosen, and its tubes want polishing, and it is generally a little more bothersome (these are only suppositions), do we like it better? Merely *because we do*. It appeals to us. We prefer the look and feel of it; it suits our surroundings and harmonises with our æsthetic intentions.

Functionalism stands on its own merits as an ideal, but its expression may quite trivially be employed in a mood of affected simplicity; to procure, for instance, for a well-to-do client—who could perfectly afford rosewood with ivory inlay—the joy of touching polished steel, not because it serves him better, but because he is in the mood to find in it a new thrill of pleasure. In this way, yacht, aeroplane, motor-car influences of decoration may, and do, find their

way into certain rooms in wealthy homes, as an expression, not of utility, but of the fashion of the moment.

There are, and there will continue to be, individuals who are ' whole-hoggers ' as regards their surroundings. There are those who demand a complete period room; and those who call for one all in steel and glass, with on the wall one large photograph of milk churns or cogwheels taken at an angle of 60°, bird's-eye view. There will also remain the eclectic patron who assembles together ' plymax ' doors, Rodier hangings, an antique painted peasant cupboard, a Regency mirror, a Venetian chandelier, a pair of steel chairs, and a brace of Staffordshire figures. After mixing the ingredients well, he will season them with some shelves filled with old books and with oiled silk curtains for the windows; and a good many connoisseurs will approve the result. For it is possible successfully to mix together things of different epochs, provided always that in their design be found a kinship of spirit, the result of the designers of all these things having spoken a common language and expressed themselves in materials not too harshly opposed in character. Oak and mahogany, Tudor and Directoire, plate-glass and François Premier, are examples of poor mixers. They can be mixed—nearly any discords can be overcome by successful transition—but their blending is most certainly not for the amateur to attempt.

The basis of success in decoration is the foundation of the design on an *idea*. This may sound trite and obvious. But the fact remains that in much decorative work, particularly that of commercial type, there is no trace of an idea or theme. It is useless to assemble notions, however clever, without a governing theme.

The designer must, therefore, at the outset, produce an

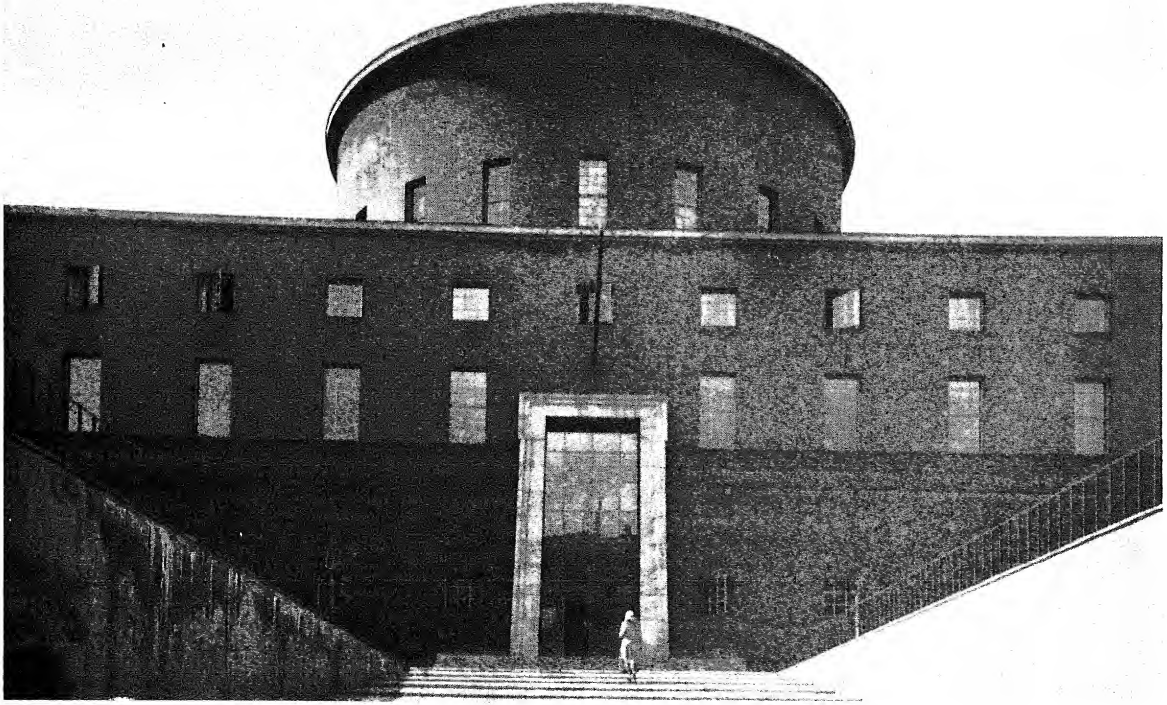

FIG. 82.—The exterior of the Stockholm Library.

FIG. 83.—A Hall interior designed to meet the expressed wishes of a client with individual taste. J. Murray Easton and Howard Robertson, architects.

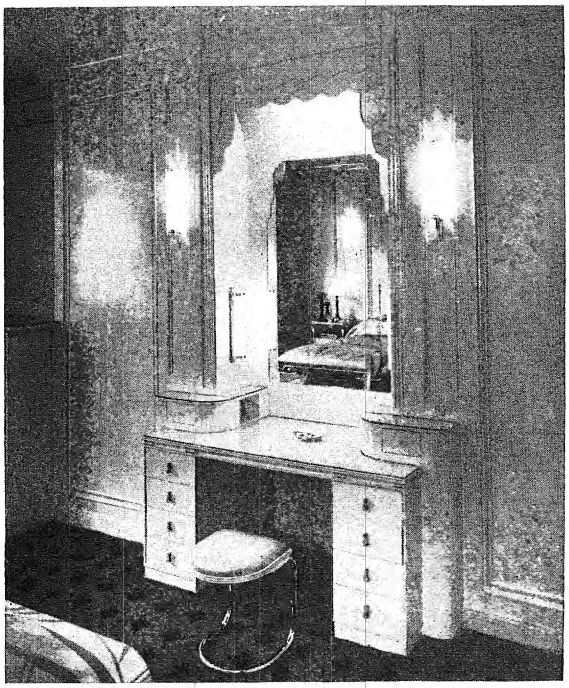

FIG. 84.—The lighting of a hotel dressing-table with the overhead lighting reflected down from a coved surface. Stanley Hall and Easton and Robertson, architects.

idea. 'One idea, one column,' says the cynical newspaper man. 'One idea, one room,' would not be a bad slogan for the decorator. For too many ideas confuse. Only a few can be expressed in a limited space; and designers must resist the temptation, when a big opportunity occurs, to crowd into their compositions all the pet themes which for years they have yearned to utilise.

The theatre auditorium, the hotel lounge, the showroom, the exhibition hall, the rooms in a private house, should all be permeated by an idea. It may be one of emphatic form, as in the interiors of Salle Pleyel in Paris (Fig. 80, page 160) and the new Cambridge Theatre in London. It may be one of gentleness and calm, as in the Chapel in the Copenhagen Cemetery. It may be one of light, as in the Ufa Cinema in Berlin; it may be one of gracious culture, as in the vestibule of the Concert Hall in Stockholm; it may be one of intellectual scholarship, as in the Library of Stockholm (Figs. 81, page 160 and 82, page 169). The larger the problem, the more necessary it is that some one big insistent thought should dominate, always producing the initial sensation, always leaving the strongest impression.

The extent to which an idea is to 'tell' depends upon circumstance. Interiors in which people remain only for short intervals can be treated more sensationally and with more novelty than those which have to do duty as a permanent background. Many people praise a novel interior, remarking at the same time that 'they would not like to live in it.' This is probably because the element of sensation is too strong, and in prolonged doses would be wearisome. Hotel rooms can be designed in a heightened key with safety, because they must produce an almost instant effect; and people like the stimulus of an original fresh thought, vigorously

expressed. They carry away with them a vivid impression, to which they have been subjected for just the requisite space of time. The majority of hotel visitors do not want a bedroom just like that in their own homes; they are as a rule ready to accept a change from ordinary conditions (Fig. 85). Hotel apartments which are designed to be occupied for long periods are in a different category; here there is justification for more subtle and less stimulating effects.

Modernism in decoration is supplying to-day just the right note of freshness. This is not purely the result of novelty, but springs from the pleasure of finding, as one does in a good modern interior, ideas which are quite logical in themselves, and are also expressed with a full confidence that they will excite interest. This confidence displayed in the best modern work is in tune with present-day ideals. 'Safety first' is becoming a little worn as a slogan; and many people are beginning to welcome the evidence of genuine enterprise.

The modern style, at its best, has the virtue of being expressive, and has at its service new and almost unlimited elements of technique. To utilise some of these to their full value in Period work is almost impossible, and this furnishes a very sound reason why Period reproduction work has little future except in individual problems of decoration.

One of the foremost of these new elements is electric light, which opens up new fields of building up decorative form. Some of the best cinema and theatre interiors of Berlin, Paris and London are conceived with illumination as one of the principal decorative themes. The Capitol, the Titania, in Berlin, the Pigalle in Paris, the reconstructed Savoy and the new Victoria Theatres in London are good examples (Fig. 89, page 181).

The study of illumination must nowadays proceed hand-in-hand with that of form since, both technically and æsthetically, the close association of the two is indispensable. The day is nearly over when the electric lighting firm is called in after the scheme is designed to provide the points and fittings.

Modern lighting is in a condition of almost bewildering freedom. Technically, nearly anything is possible. Yet some of the problems which lighting presents are not yet solved.

One of the chief practical difficulties is that of expense in current consumption. With the old type exposed fitting, of the direct or semi-indirect type, an efficient though not particularly decorative lighting was provided. Nowadays, with the demand for concealed sources of light, and with lighting by reflection only, far more power is required. The consumption of current in some of the latest hotels and theatres is high, and the cost of maintenance also.

The lighting of each class of interior demands special study; and no general rules can be laid down, for practice varies according to taste, and in different countries. The vogue in France is divided between semi-direct lighting, with the illuminant screened by glass or other material, lighting by reflection—that is to say by casting partially or totally screened light on to a reflecting surface (Fig. 84)—and the panel system, in which the source of light is built flush into the wall or ceiling, with the source of illumination screened by glass. In the most refined systems of this latter type the lighting elements are above or below the glass, and the light visible through the panel is derived from a reflecting surface.

In Germany concealed lighting has a lesser vogue, except

in theatres, and the actual element is often used as a motif of decoration. Tubular lamps, or those of the ordinary pear-shaped type, are frankly exposed, and by clever grouping made to form a decorative pattern. The element itself is susceptible of treatment; and a further extensive field will be opened up when gaseous tubes become available for internal illumination.

The German system is very promising in its possibilities, for it stimulates development of the actual lighting element, which almost certainly has not reached finality in design. Bulbs of different shapes, with the filament assuming a decorative line, are already appearing on the market, and have value both alone and in conjunction with concealed lighting.

Lighting by reflection, where the ceiling is used as a reflector, is apt to be somewhat depressing, and the architect is well advised to make a critical study of existing examples of this type, as well as of lighting through ceiling lay-lights, before determining his layout. (It is also to be remembered that polished surfaces, even enamel paint, are apt to create unexpected effects of reflection, and this should be considered in dealing with concealed lighting.)

The reason for the sense of depression seems to lie in the fact that the brightly-lit surfaces are above the head, whereas it is the floor and lower sections of the room which really demand the brightest light. The sensation is somewhat that of being in a deep shadowed street, with a glimpse of brilliant sky visible in the cleft overhead. The tendency is to look upwards, towards the light, and this imposes strain.

The difficulty is largely overcome, however, when exposed points of light are added to general lighting by

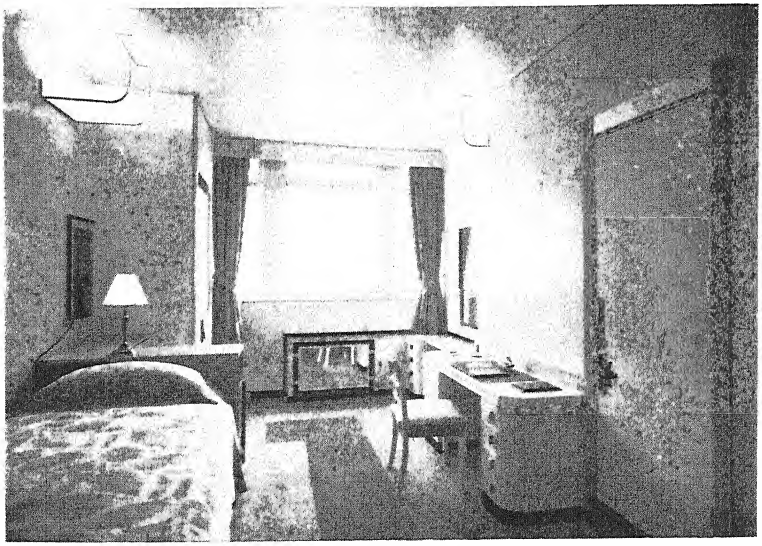

FIG. 85.—A Hotel Bedroom at the Berkeley, London, by Stanley Hall and Easton and Robertson.

FIG. 86.—An interior with a pleasant sense of light and space. Designed by Le Corbusier and Jeanneret, and Charlotte Perriand.

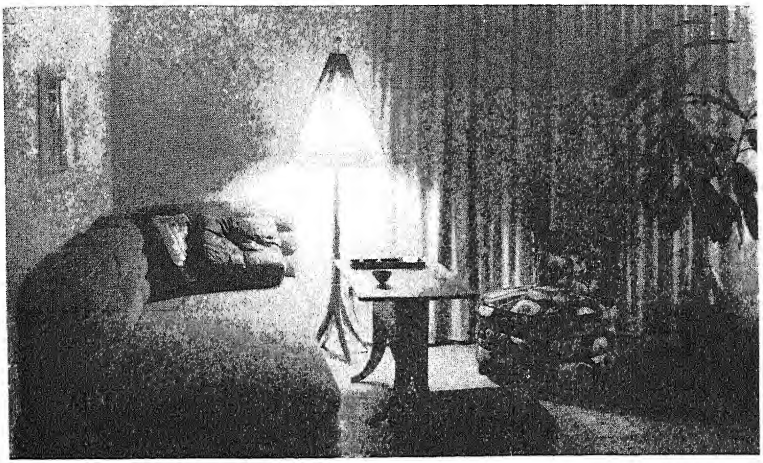

FIG. 87.—Lighting from a standard lamp. Living Room of the house of Karl Bertsch, Berlin.

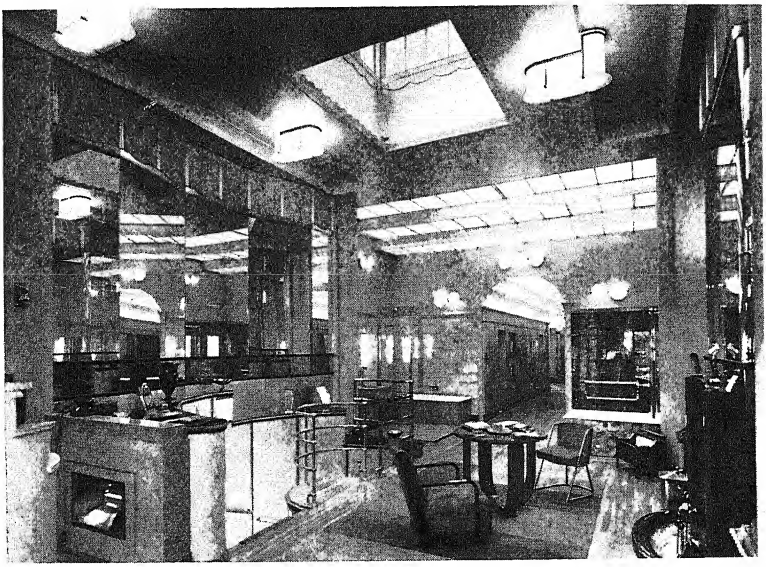

FIG. 88.—The interior of a Bond Street shop, designed specially for the purpose of effectively displaying bathroom fittings and fireplaces. Stanley Hall and Easton and Robertson, architects.

reflectors, coves, or other indirect method. The isolated brilliant points add gaiety, and the local intensity necessary to give contrast value to the even general lighting. The principle involved, it will be recognised, is a general one of effects in composition.

Local direct lighting also provides shadows, and these may be developed to have great decorative value. One has only to enter a room lit by a single table or standard lamp, and note the charm of the parabola of light which, emanating from the top or bottom of the shade, breaks richly into the shadows on wall and ceiling, to realise the possibilities of shadow effects consciously employed (Fig. 87).

The designer aiming at comprehensive decorative treatment both internal and external should, where possible, prepare a tone study of his nighttime effects.

Lighting from unusual positions is possible in rooms where decorative effects are sought, as, for example, from the tops of pelmets, from over doors and windows, and from the tops of cabinets and furniture generally where these are above eye-level.

The attempt to reproduce—except for practical working purposes — effects of natural daylight, is perhaps misguided. In the evening the modelling of a room takes on a fresh aspect, and new beauties; and these are lost if the same source of light is used for introducing both natural and artificial light.

In the large Ledger Office under the Banking Hall at Lloyds Bank, Cornhill, daylight illumination is provided in numerous wall and ceiling panels. This room has no windows, and is always artificially lit; so that here the attempt to produce the sensation of daylight, which in working

hours is so desirable, is thoroughly justified on practical grounds, the decorative effect being entirely a secondary consideration.

An almost unlimited number of new and attractive effects are possible with modern lighting. Particularly is this true where the lighting element itself is well-shaped, as is the case with tube lamps, when attention can be concentrated on their placing and pattern. In the more 'functional' type of decoration, the all-glass unit with a minimum of metal-work, of the type so popular in Germany (and used also at the Stockholm Exhibition of 1930), is both effective and practical.

The type of fitting which depends for its decorative value on numerous small parts, such as suspended plates of glass, is very difficult to clean and maintain, and probably marks a more or less transitional stage between the old-fashioned chandelier and the fitting of the future, which will no doubt tend increasingly towards simplicity.

Too little consideration has been given in the past to the relationship of ceiling and floor to the walls of rooms, except in large-scale problems. Both elements are important, and on a drawing are difficult to show; so that the tendency is for the designer to concentrate on walls alone. Yet it is obvious that where interest is concentrated on ceiling and floor, the wall treatment may be very simple, and the same principle applies when the location of the interest is reversed.

A perfectly bare room, without a single moulding or decoration, or a stick of furniture, can be made interesting by colour alone, by the treatments of each plane of wall, and the planes of floor and ceiling, in different tones of flat colour; for it is possible to make play with the sense of

space by utilising, as mentioned earlier in this book, the properties of colour as regards ' advancing ' and ' receding.' In the Experimental Housing Exhibition at Stuttgart the modelling of simple interiors was emphasised in this way, and both French and German modernists have utilised the resources of low-toned colour very cleverly in several of their domestic interiors.

In all decoration work there is great value in localised interest, or in the introduction, amongst steady values, of an element which is slightly unexpected. The most successful modern work, when analysed, is found to exemplify this principle, which is also utilised in exterior design, where it sometimes appears in the guise of ' inflection ' or ' punctuation.'

These terms, in their literal meaning, are practically self-explanatory; and to illustrate them we may refer to many of Erich Mendelsohn's designs, in which he employs a favourite—and very effective—device of terminating a great sweep of horizontal façade by a sudden convolution at one end, which brings it to a vibrating stop without the aid of the cruder device of butting it against another element, such as a vertical pier or pylon. This treatment embodies both inflection and punctuation, the former a preliminary to the latter. In his interiors, Mendelsohn's effects are equally powerful. He succeeds in drawing out his horizontal lines to their fullest extent, almost at times to the breaking point, and then, while the eye of the spectator is in full pursuit of these vigorous flowing lines, Mendelsohn arrests them, makes them as it were recoil upon themselves, and always at just the right point. Mendelsohn knows how to play upon form as a violinist plays upon a string. He can produce vibrations from a single line.

Le Corbusier is one of the most stimulating of modern architects, and impresses his character upon his interiors, which are marked by strength of line, strength which is like that of wire, taut and thin. Quality of geometric form, coupled with a keen sense of the severe beauty of well-designed mechanism, permeates his work, the interest of which is sometimes heightened by some simple geometric contrast of form. An instance occurs in an interior in which rectangular forms dominate, but where a note of contrast is provided by a single circular light in the ceiling, glazed with a rimless sheet of glass. This single roundel, possessing the curious elegance which is possessed by a ship's porthole, has an absolutely arresting quality (Fig. 86).

Such instances may appear trivial. Yet the brightest effects are often those produced with a minimum amount of obvious effort. The architect who is sensitive to form, and knows how decorative pure form can be when shrewdly manipulated, is able to endow design with a quality of vitality which eludes the majority.

Many decorators are easily recognisable in their work, and have developed a style or manner of their own, due to the fact that in every problem their designs are based on the same principles and method of approach.

Howe and Lescaze in America; Charles Siclis, Djo-Bourgeois, Mallet Stevens, in France; Josef Hoffmann in Vienna, Fritz Breuhaus and Walter Gropius in Germany, Carl Bergsten and Gunnar Asplund in Sweden, are just a few names, taken at random, of men who in decoration are always distinctive. Breuhaus combines severe and luscious forms in a rich modernism, of which his s.s. *Bremen* decorations are a good example. Hoffmann is delicate, sensitive; he attracts by the constant 'flicker' of his

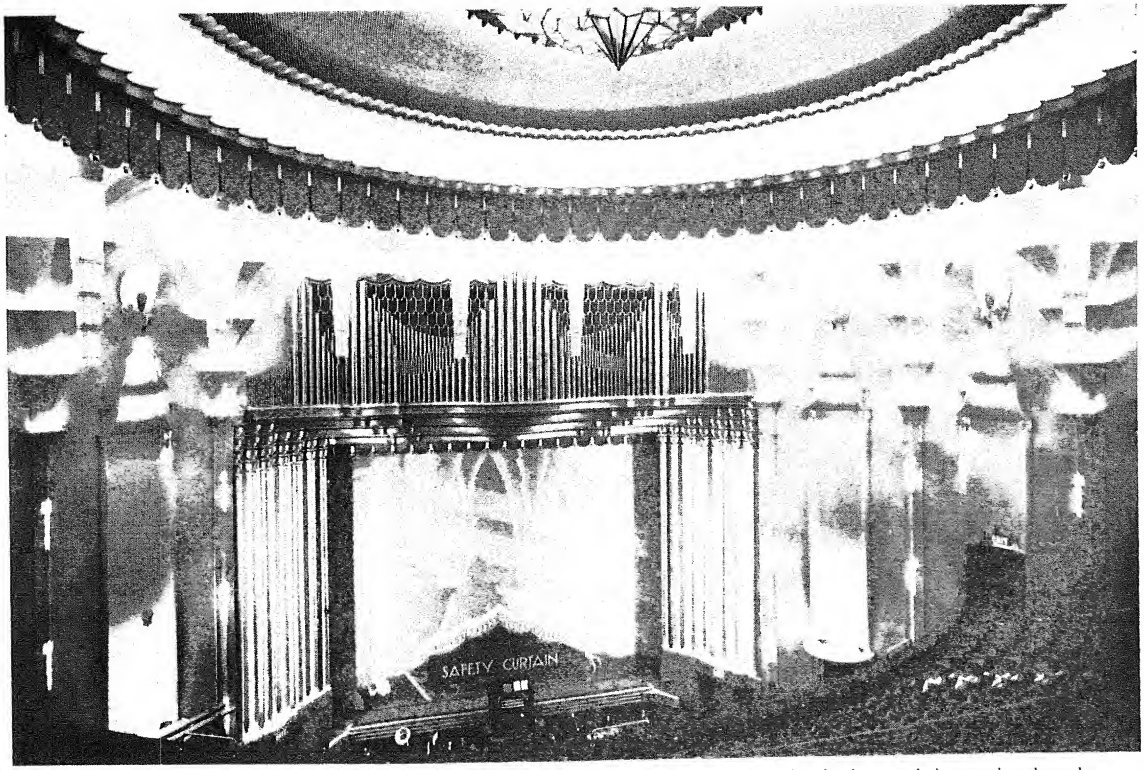

FIG. 89.—The Victoria Cinema, London, by W. S. Trent and Walmsley Lewis, with its internal decoration based upon an effective utilisation of artificial light.

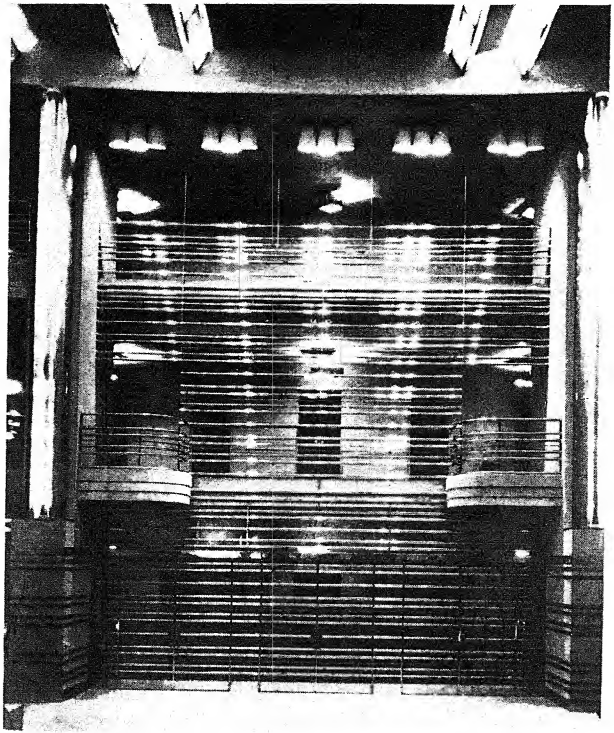

FIG. 90.—Metal grille, played upon by coloured light, in the foyer of the Théâtre Pigalle, Paris. Charles Siclis, Just and Blum, architects.

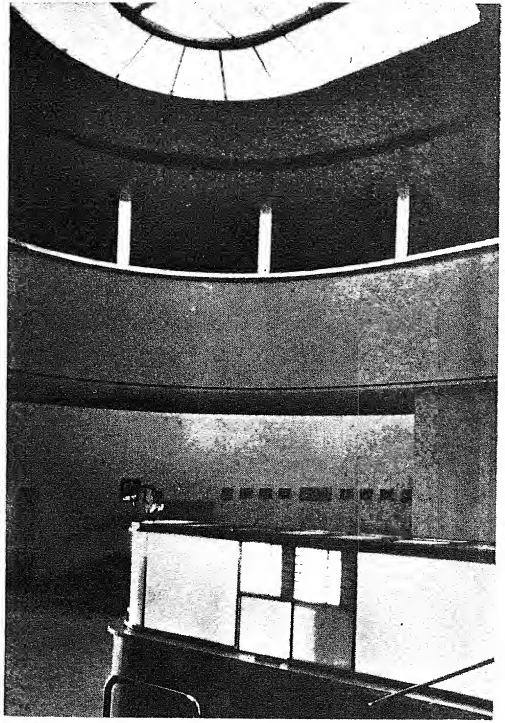

FIG. 91.—Detail of the vestibule in the Ufa Universum Cinema in Berlin, by Erich Mendelsohn.

decoration, which is like an ever-sparkling flame. Siclis relishes a steel-like fragility, and in his hands even emphasis of form, as seen in the Théâtre Pigalle foyer, has an undercurrent of the influence of design in metals (Fig. 90). Mallet Stevens enjoys the cube, and the sharp arris, yet mixes rectangles with sweetness, while Djo-Bourgeois introduces mirrors, lights of alabaster, and plate glass into designs of a sophisticated simplicity which depend for their main effects on rectangular forms and broad surfaces.

All these designers are consistent in their effects; they know what they want, and their treatment of each problem springs from a basic idea; whereas the imitators, the purveyors of the *moderne*, merely assemble the souvenirs picked from various sources, and present a modern *hors d'œuvre* of singular messiness, in which there is something for every taste. The English palate is rather prone at present to these *moderne* mixtures, which have the doubtful advantage of being compromises in which no one is committed to the expression of a definite point of view. The United States is to a lesser degree in the same state; and only a few of the continental designers have a clientèle which enables them to push character in decoration to anything like a logical conclusion.

Effects of form—dynamic, reposeful, attenuated, elegant, playful, luscious, rigid, naïve, sentimental—are the mainspring of the decorative theme. The designer must make up his mind as to general character, and then, in every detail, work out his theme. Sometimes form is expressed almost without dependence upon face material, as in the Vestibule to Mendelsohn's Universum Cinema, where a sensation of tension, of arrested movement, pervades the general design (Fig. 91). At other times form is used as the

medium for a display of elegant applied decoration, in which case it should itself be elegant, as is the case with the offices of the Swedish Match Company by Tengbom. Or perhaps play of form is kept in restraint in order to throw into relief material of very characteristic properties, such as, for instance, glass; we see the result of such a treatment in the rectangularity of the hall of the Amsterdam Co-operative, with its vitreous walls enriched by a plaque of metal sculpture (Fig. 106, page 216), and on a smaller scale in the clever-mannered glass bathroom designed by Madame Lipska (Fig. 93, page 192). In all of these examples the form remains of first importance, and the overlay, the surface material, is closely married to it. Structure, form, decoration, inevitably depend upon each other.

The decoration of private rooms, as distinct from that of public buildings, presents special problems; and, in new work especially, the architect should be the decorator, for otherwise form cannot be moulded from the outset in the way that is necessary to ensure decorative success. It is also necessary for success that the architect should be early acquainted with his client's wishes and requirements, even in respect of what appear at the outset to be unimportant details.

Take, for example, the curtaining of windows and openings in general (Fig. 92). This is an everyday problem, but one which requires consideration at an early stage. In ordinary humdrum work little attention is paid to it; the upholsterer will provide a rod or runner, and all is well. But with circular- or segmental-headed windows, especially when the head occurs under a vaulted or shaped ceiling, with penetrations, the curtaining presents many difficulties, the satisfactory solution of which may entail modifications even to

structural forms. Radiators may also cause difficulties. They are apt to project, and yet both client and architect may desire long curtains, the runners for which are wanted in a box formed in the window head, and not on the wall face, since in the latter arrangement the curtains blanket the architraves. Before the window opening can be detailed, therefore, the architect has to reckon with these little local problems, else he may find that his room is quite successful until the moment comes for the furnishing. In a great many cases, in fact, the task of decorating a room should commence with the housing of the curtain pole!

The satisfactory treatment of enclosures to radiators is always difficult; be it noted, however, that large areas of open grille are not always necessary; slots at top and bottom of the casing, if properly proportioned, are scientific, and more interesting to treat. Modern American practice was formerly in advance of our own where radiator installations are concerned; but the English panel heating or concealed border heating nowadays helps to smooth the decorator's path. Theoretically, the radiator might be left exposed, on the grounds of frank expression. But in practice radiator designs are still too ugly to be likeable.

Furniture should also be visualised at an early stage, where this is possible. Perhaps the architect will supply his own designs; in which case one or two points are worth noting (Fig. 94, page 192).

One is that the scale of furniture is most deceptive on a drawing. Most architects err on the side of heaviness, forgetting the diagonal view of, say, a square table-leg. Modern types of furniture in particular require, but seldom receive, a delicate proportioning. Their apparent simplicity is frequently sophisticated, and not always economical, for the

severe lines call for fine finish; and the desire to obtain a certain sense of fragility, of suppression of the more obvious methods of support—such as chair stretchers, for instance—raises an additional problem of technique. The modern designer is often trying, unconsciously perhaps, to echo in furniture the same sense of implied structural stability that is found in steel and concrete architecture, where walls overhang, and slender supports carry apparently massive loads. So the furniture designer supports a desk or dressing table on two thin slabs of veneered wood, without any cross stretcher, instead of on four solid legs comfortably housed behind the skirt; and very often these slabs of wood are halved at the top, so as to have the appearance of gripping the table top. If the structure were in riveted steel instead of wood, the construction would be easy, and logical enough. As it is, the effect is stimulating, because it is elegant and intriguing, and because the mind reacts to an appreciation of the skilled technique involved in securing strength with lightness; but it is not genuinely straightforward, nor typical of joinery methods.

Frameless mirrors, rimless sliding doors of plate glass, heavy plate-glass table-tops with a minimum of metal framing, book stands with unsupported angles, are all echoes, in furniture design, of advanced modern architectural forms, and a number of these notions are impracticable in their application to everyday hard use, in spite of their apparent simplicity and their affinities with mechanism.

This is not to say that ' mechanistic ' furniture is either impractical, or the expression of a passing phase. Steel tubular chairs, for instance, as produced commercially to-day by certain firms, are light, comfortable, resilient, elegant, firm, and easily movable. Yet in conjunction with these

chairs we find tables topped with glass of $\frac{3}{4}''$ or $1''$ thick, which are too heavy for any maidservant to move, besides being far less stable than a table all in wood. Ownership of a piece of this sort may give genuine pleasure to many of us, one reason being that the design with its lightness and transparency is 'space-making'; but we must not blind ourselves to the fact that, on functional grounds, this modern table is perhaps not as good as an old-fashioned mahogany table costing just about one-half of the price.

Another common difficulty in the designing of modern furniture is the tendency to make it too assertive and self-conscious. Some of the pieces which are designed, in wood, with a mechanistic severity, are quite affected, and their simplicity is worn with a smirk. The art which is behind this simplicity is too obvious; the simplicity is not genuine, but is achieved by both designer and craftsmen as a result of scratching their heads extremely hard, a process for which some client will probably pay heavily. Pieces of furniture should not sit about in the room with that air of pleased priggishness which is certainly not typical of the best of old furniture. Many old pieces, even when quite ornate, have an unassuming and friendly character, though others are just as unsympathetic as the most extreme products of the *de luxe* school of modern France. Well-designed modern pieces can, however, be just as human as old pieces; more so, because their humanity is ours, and not that of the age of ruffles or crinolines. But such pieces are tremendously rare, because the manufacturer of to-day, in the English-speaking countries particularly, has been so steeped in reproduction work that he has to try to bridge, in the space of a few years, huge lacunæ in the normal evolution of design. The modern spirit has caught him unawares, and his design

technique is (with a few exceptions) unequal to the task of expressing it while still maintaining production on a commercial basis.

With the gradual development in design which is taking place, there are signs of a tendency to reconsider materials and finishings.

Wood, for example, is being appreciated anew, both in veneers and in the solid. Many architects may have noticed how comparatively attractive are many commercial products, such as turned wooden lamp standards, chandeliers, etc. (of the type to be seen in the shops of carvers who supply to the trade), as long as the wood is in its natural state. But once these things are painted or gilded, they become utterly commonplace. Presumably, therefore, it is the finishing which is to blame.

The reason is that in most types of finishing, the first step is to clog the pores of the wood with a ' filler.' The life of the wood seems to vanish under this process. Whereas with, say, a waxed finish, it is preserved and enriched.

The cult of ' pickling ' or ' limeing,' which at the time of writing is so much in vogue, is therefore not to be disdained. It reflects a renewed appreciation of natural surfaces, a consequent desire to get rid of deadening stains or artificial polishes, and in addition it is in sympathy with the modern appreciation of light and the play of light on form and surface. Finished wood surfaces reflect light, unfinished wood absorbs it, and both have their uses and value. But with the modern vogue for soft pale colouring the use of non-reflecting surfaces has great possibilities, because of its value as a contrast to occasional brilliant surfaces of materials like steel or mirror. Too numerous reflections annul each other; reflecting surfaces cleverly related contribute an

effect of confused brilliance which, when employed to an end, can be extremely useful. But for constant daily use more of the quality of repose is generally to be sought; and the architect who makes a close study, not only of wood, metal, and glass forms, but of their surface characteristics and possibilities, is helping to improve both craftsmanship and design technique.

VII

The House

DOMESTIC design is so much a matter of individual tastes and requirements that a discussion of general character would fill many pages. And even then it would not be possible to dogmatise on questions of planning and furnishing.

Considerations of site, location, development, local influences and materials, are also too involved to deal with here. It can be assumed, however, that it is possible to design an absolutely modern house, fulfilling the most advanced requirements, without offence to landscape or local traditions. That it requires skill is obvious; and that a house of any type, which is planted in a field, or on a bare hill top, without any assistance from landscape development, should not be finally judged until its surroundings have matured, is equally obvious. Architecture based upon unusual forms requires a setting just as much as does building on traditional lines, at times even more so. In design of a modern type, site development is often reckoned upon by the designer as a foil to architectural severity, and until the layout is complete the composition is only partially developed. This point requires stressing; for, in several cases where modern houses have been built in England, the results have been severely criticised before the complete scheme, as visualised by the designer, has been presented to the critics.

The analysis of the domestic programme, like that of any

FIG. 92.—The curtaining of windows considered as an integral part of the design. Dining room by J. Murray Easton and Howard Robertson, architects.

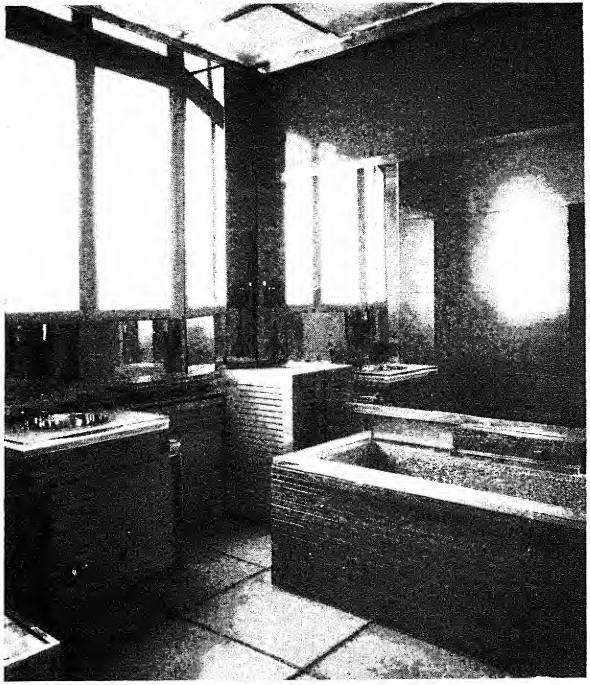

FIG. 93.—Walls, ceiling, and floor executed in glass. Bathroom designed by Mdlle. Gorska and decorated by Madame Lipska.

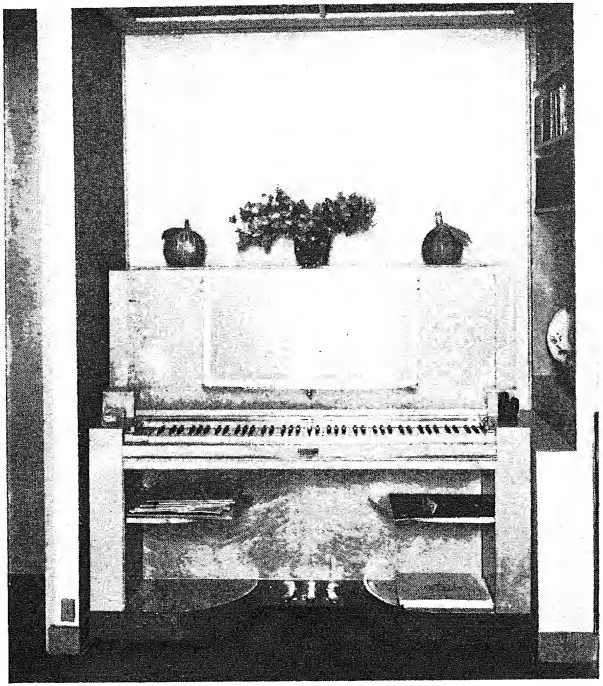

FIG. 94.—A piano designed by an architect, with provision for music. A. H. Girard, architect.

other type, can be set down in schedule or diagrammatic form. The cost factor, of course, intervenes very strongly, more so than in almost any other building programme. But in the bungalow, as in the mansion, the same theory holds good, namely that the design should be developed from the basis of function. The structural means, and the expression, are secondary, the latter being to a large extent controlled by the first two. This approach to domestic architecture is comparatively modern; for in certain phases of traditional work the façade was more or less a convention, and where its preconceived order was in danger from the demands of function, the latter was sacrificed without hesitation. It is only in very recent years that this attitude has lost ground; yet both clients and architects even to-day sometimes join in a conspiracy to refuse the demands of convenience and service in order to maintain in elevation an expression decided upon before the plans are made. As a rule, there is compromise in these cases; one façade is made the frontispiece, and on the others concessions are frankly made to the demands of internal features. Architects show at times amazing skill in effecting the necessary adjustments. But, as a rule, there is one elevation which defeats them; it is the 'ugly duckling,' featuring the windows of larders, bathrooms, back stairs, and festooned with pipes which one is only too happy to be able to assemble in sordid company on the same elevation as that on which a proud parapet becomes a humble eaves-gutter.

Theoretically, at any rate, we will agree that the design should be based upon the expression of utility, in which case the 'tree of function' may be drawn.

The 'functional' service of the house is of different types, depending upon the various branches of activity

which the house contains. These, broadly speaking, are triple: that of day-time existence, expressed in the living quarters; that of night-time existence, taking place in the sleeping quarters; that of service, which is concerned with both, but primarily with day-time activity.

So we have three headings, which may be expressed on a 'tree of function,' with as many branches as are required to cover every single aspect which is to be considered under the three headings. In Fig. 95 is suggested an embryonic 'tree.' The formation of such a tree, drawn out and kept constantly before the architect's eye, may prevent him, in the initial stages of the development of his scheme, from overlooking main considerations under the clamorous pressure of minor ones.

Many of the factors, it is obvious, will vary with individual requirements; yet, in recent years, there has been a collective tendency to shift the point of view as regards certain aspects of domestic planning, and thus the tree of function of to-day would contain in its branches certain provisions differing from those of yesterday. The architect's duty is obviously not to dictate these provisions; but he is sometimes asked to suggest them in part, occasionally even *in toto*. He has, perhaps, ideas of his own which, while totally new to the client, appeal to the latter when properly presented. The architect should be the leader in planning thought, holding as he does general practical theories of design which can be applied to individual plans. Some architects have, in fact, attracted their clientèle almost entirely through their expressed ideas, Sullivan, Lloyd Wright, Le Corbusier and Jeanneret providing cases in point. Not all clients who employ such architects adopt all their suggestions; but the mental attitude of these men

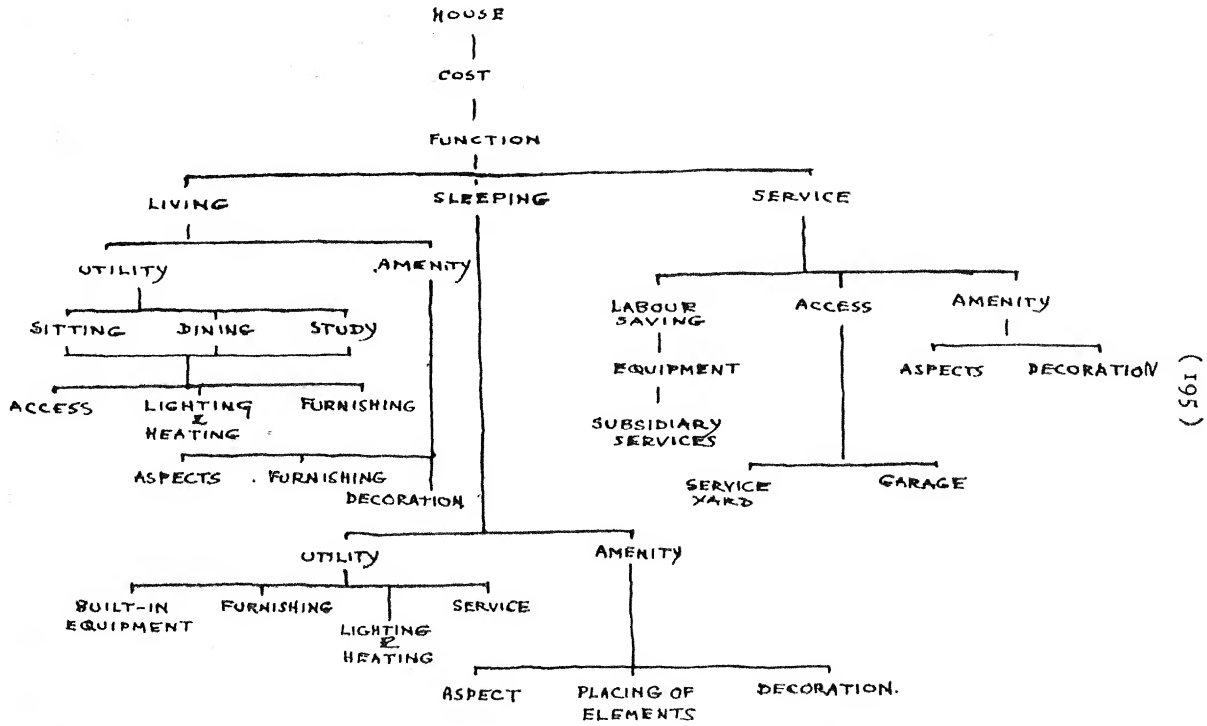

FIG. 95.—A ' Tree of Function,' in which the various points to be considered are set down in sequence. The drawing of such a tree enables the designer to keep his data conveniently before his eyes.

towards the problem is so stimulating that the client may well expect interesting results when this fertility in invention is applied to his particular problem (Fig. 96).

Habits of living have not changed very basically, perhaps, in the course of the last centuries, but certain demands are

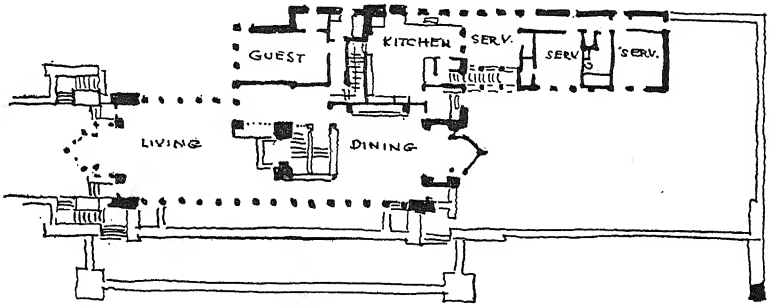

FIG. 96.—Plan of a house by Frank Lloyd Wright, who introduced into American domestic architecture a fresh conception of the treatment of internal space.

made to-day which, if they become general, may ultimately affect profoundly the conception of the domestic plan.

Of these, improved services rank high in importance, including the provision of more scientifically planned and equipped kitchen quarters, and increased accommodation in the matter of bathrooms and wardrobe space. Other demands are those for bigger windows; for opportunities of sleeping out-of-doors, on sleeping porch or roof; for exercising space, particularly on cramped city sites (*vide* house in Paris by André Lurçat, Fig. 97); for larger rooms, without an increase in overall dimensions, entailing a more intensive utilisation and organisation of the plan, and the maximum service from every cubic foot of contents.

In modern architecture an attempt is made to meet these demands, which are only in a few cases formulated together in any single problem. The average client generally has

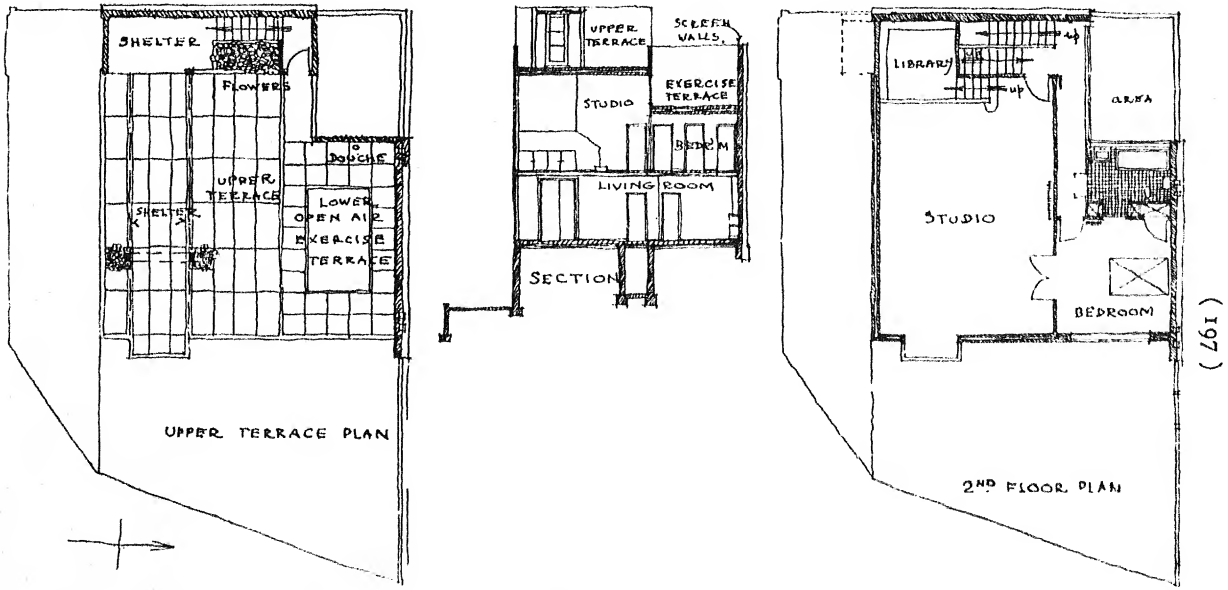

FIG. 97.—Bedroom floor plan, section, and upper terrace plan of a house in Paris by André Lurçat. The upper roof terrace provides a sunken private exercise ground accessible by stairs from the bedroom and screened from neighbouring houses.

only one or two pet individual requirements of a modern nature; the rest of his stipulations are concerned with matters of taste and character. He is seldom logical throughout, and, as a consequence, the 'Ideal Home' is never built. The supply of really well-designed houses runs in the same vicious circle as that of good cheap furniture. The public does not demand it, because the manufacturer is not producing it; and the manufacturer is not producing it because the public is not demanding it.

Yet, gradually, discernment will grow, and the programme will crystallise. Already the American takes central heating for granted, and very often uses his boiler-room, with its gas furnace, as an extra recreation room. He expects his bathrooms to be numerous, his verandah to be a commodious open-air room, and in certain cases demands sleeping porches as a *sine quâ non* for at least two rooms. But, supposing the demand for this open-air accommodation grows, it will lead to fresh architectural solutions; perhaps to the open-air sleeping recess opening off every bedroom, perhaps to a much greater development of roof and terrace.

It would be an advantage in many ways if flat roofs became general, for the pitched roof of a house is a tyrant as regards the plan, making really flexible planning almost impossible, and in spite of its uses and æsthetic charm, it is too much of a fetish. Quite a number of people would risk building with a flat roof as far as they themselves are concerned, but fear that, if they wished to let or sell, its comparative strangeness would be a liability (Fig. 99).

The flat roof problem, in respect of weather-proofness and insulation, is very close to a solution; and its opponents are apt to forget the troubles which beset pitched roofs in cold

climates, where the gutters and down pipes freeze, and fairly constant upkeep is involved.

The modern plan must make the best use of space, which is the real problem of planning. The space should preferably be physical; but also, if possible, it should be suggested, even when it is not actually present.

To utilise space on congested sites in a logical way, those parts of the house which are most in use should occupy the best locations, on outside walls. Every single element which does not demand an external position might be concentrated in the least attractive parts of the plan, that is to say in the central unlit spaces. Elements which might be placed in the unlit spaces are bathrooms, lavatories, cupboards and storage spaces, and possibly staircases, for all of which top lighting might be arranged (Fig. 25, page 63).

To the staircase is usually conceded at least one external wall and a considerable amount of space. But with flat roofs the staircase might be placed in the kernel of the house, for it can then be very effectively top-lighted. Also, the resources of the spiral stair as a space-saver have not been generally explored, except by some of the modernists on the Continent. A generous spiral makes quite a practicable stair, and nowadays people are well accustomed to them in tube staircases. The type of staircase preferred is, after all, largely a matter of custom. The steep Dutch staircase has been negotiated by thousands of young children and old people in Holland, although at first sight it frightens the English visitor. But the same Englishman makes no real difficulties about ascending a 2′ 9″ staircase, all ‘winders,’ in an old house.

As regards internal bathrooms and lavatories in private

houses, development in England is still held up by building bye-laws, which have been framed on the assumption that methods of sanitation proved perfectly healthy in nearly every country but England are not really safe. Of course, these bye-laws will eventually be relaxed, as is already the case with hotels; but in the meantime they cause endless trouble to the planner, and in the past have added considerably to building costs, particularly in the case of offices, flats and hotels. In the type-plans demonstrated at the Stockholm Exhibition were internal bathrooms extremely compact, well-fitted, occupying the least valuable area of the plan, and by their central position thoroughly accessible and capable of a ventilation which was not, however, always provided; also, the comparatively large living-rooms achieved on small sites in some of the other modern continental plans are made possible chiefly by the adoption of the internal bathroom.

Incidentally, the bathroom is not properly developed as a unit. In England bathrooms are too wastefully planned, and are too few in number. Lavatory basins might well be banished from bedrooms, and each bedroom might have a shower and a basin, or else a basin and a very short 4′ 0″ bath, which occupies very little room. A certain percentage of American hotels and continental flats have bathrooms with no bath and a shower only. These save space, and consequently can be rented at a lower figure. But in a private house, the shower-toilet-unit can be supplemented by a larger communal bathroom, as an auxiliary. The saving of time in a family dwelling, where these shower units are installed, would be considerable; and there would be more encouragement to personal cleanliness, and less scrubbing of bath interiors. But the average house-builder is fright-

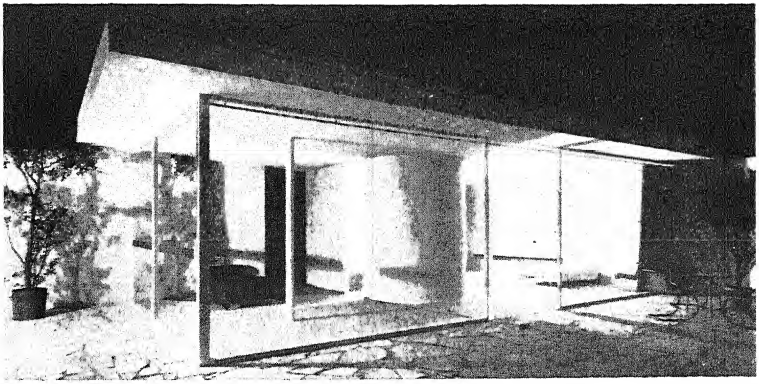

FIG. 98.—An interesting and novel conception of a small dwelling with a walled garden. Spacially, interior and exterior are united, portions of the glass screen walls being lowered below ground by electricity. Designed by Mies van der Rohe, one of Germany's most creative modern architects, and shown at the Berlin Building Exhibition of 1931. In this conception Mies has revived the ideals of plan division originally enunciated in the work of Frank Lloyd Wright. For plan see Fig. 103.

FIG. 99.—Model of a modern Long Island House with flat roofs, designed by Philip L. Goodwin, architect.

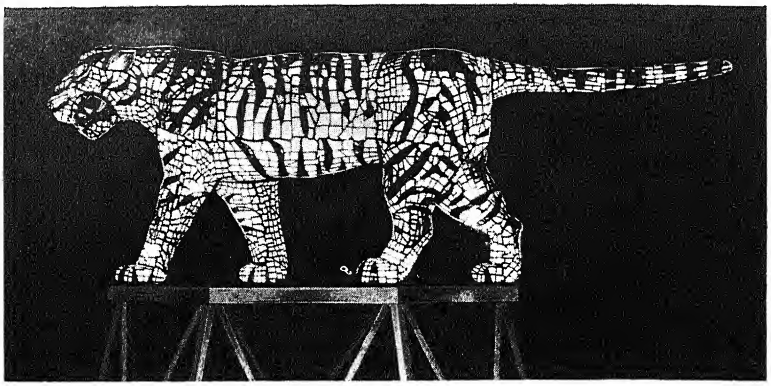

FIG. 100.—A 'Stransign' sign modelled in the round, executed in glass and steel. The lighting is internal.

FIG. 101.—Design in various commercial types of glass, in the windows to the façade of the 'Semaine à Paris.' R. Mallet Stevens, architect.

ened of the built-in shower bath; and only the most *de luxe* hotels possess them. Hotel and private house bathrooms are frequently described as 'equipped with shower' when a rose on a rubber connection serves to splash the bather, the walls, the screen, and the rest of the bathroom, with a consequent waste of domestic labour.

The whole bedroom unit also requires careful overhauling. The modern bedroom would be all the better for containing nothing but a bed, with behind its head a fitment containing all those small accessories which are a normal part of bedroom equipment. There should be a metal-lined ventilated cupboard for the pillow, which need not therefore be either exposed all day or else covered with a bedspread on which is deposited the daily dust. There should be an electric light for reading, and small adjoining cupboards for medicines, books, and general bedroom utilities, and a conveniently-placed plate for light switches, bell, and telephone connection if required. Everything, in fact, should have its storage niche. But beside the bed, or beds, the room need contain nothing.

In this way, the bedroom could be greatly reduced in size, the space thus saved being devoted to an adjoining dressing-room, properly fitted on ship's-cabin lines, and really comfortable. The dressing-room could be pleasantly warm, while in the sleeping-room the windows could be wide open; and thus there would be fewer risks of chills. Most people dislike an overheated bedroom; but there are also a great many people who detest dressing and undressing under freezing conditions palliated only by the smallest gas fire commercially procurable. If separate sleeping and dressing quarters were provided, on the lines suggested, the difficulty would be avoided, and apart from the fact that

the dressing-room provides an attractive private den, the arrangement is more hygienic and orderly.

Good planning is orderly, logical, and harmonious arrangement. To achieve it, one must scrutinise the sequence of the daily actions of the average human being, and think out the best methods of facilitating them. At present, we blindly follow custom. A bedroom has a bed, a night-table, a dressing-table in front of the window, and so on. Why? Merely because a bedroom has always been furnished in this way.

A fresh outlook, an examination *de novo*, is required in respect of the 'sleeping' function of the house. It is difficult, because the prospective house builder comes on the scene with his preconceived idea of '2 large double rooms, a dressing-room, 3 small single rooms, etc.' He is following tradition; and he obtains from the architect that which he asks; the rightness or otherwise of his demands he has scarcely questioned.

The living-room section of the house is in less need of overhaul, but here again there are points which are overlooked. Mention has been already made, when considering 'The Plan,' of the study of the window element. The fireplace, if it is still maintained, remains the focal point of the average room; its location out of draughts, away from the line of 'traffic,' is generally provided for. But there still remains the question of the door.

Nowadays, the principle of the 'living-room' is almost universally accepted; for the very good reason that people cannot afford the luxury of Drawing-room, Morning-room, Library, and Study. The Living-room becomes the place where people meet, where all the activities previously spread through four rooms are perforce concentrated. But the

Living-room is still planned as though it were merely a living hall, and as if the need for privacy, formerly met by other types of room, was still being catered for, whereas in reality the Library and Morning-room have gone, and frequently the Study as well, with nothing provided to take their place.

Instead, therefore, of the Living-room being merely a communal family lounge, its shape should be considered from the point of view of privacy.

The door, as an element of a room wall, is disturbing to privacy. In a family house, particularly in the Living-room, it is constantly and irritatingly in use. If the sensation of privacy is to be established, the door, as a *visible* feature, should be suppressed.

This is fairly easily accomplished, by careful planning. The opening can be so placed, in the Living-room as well as in all but the smallest rooms of the house, in such a way that it is screened and invisible from the main room area. The principle involved is easiest to explain by illustration. In the accompanying diagram (Fig. 102) is an example of a layout involving this principle of the screen.

This screen idea can serve equally well, as the diagram shows, to break up the space of one large room in such a way as to provide a certain local privacy, without affecting the general sense of space. On the contrary, the low screens, over the top of which the ceiling of the room visibly extends, by acting as ' baffles,' increase the sense of apparent area, suggesting a spaciousness above and beyond the free floor area. A legitimate sense of illusion is introduced, which can be greatly heightened by the resources of colour, reflecting surfaces, and so on. The plan-form takes on a new and interesting aspect, and the practical aim, that of

providing spaces in which one may read, write, or lounge—in one room, but yet in comparative seclusion—is achieved.

The safeguarding of calm amd repose, almost as necessary as that of privacy, can also be catered for, the chief enemy being noise.

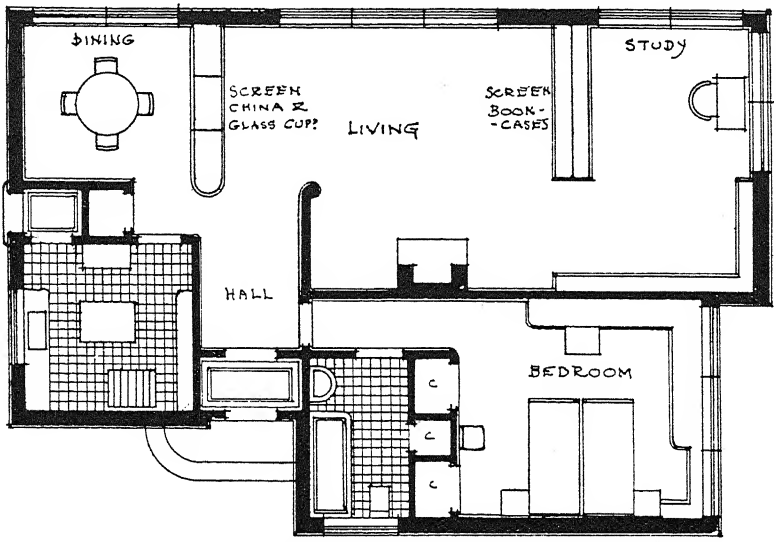

FIG. 102.—Diagram Plan of domestic units, with screened sections to Living Room.

The arrangement of doors which has been advocated greatly assists in noise elimination; this would be further aided if doors were made and hung on the continental system, with rebated edges, at top and sides, and a sill at the bottom. Doors of this type, commonly used in Switzerland and other countries with extremes of climate, also eliminate the draughts which are the bane of all houses which have not central heating. A further suggestion to avoid noise is the use of cork or other sound-deadening material on table tops, hatch ledges, and any surface liable

to be used for 'service.' Many functions of service, the laying of meals, the setting down of objects, the scurrying through corridors, echo in the home the din of the streets from which the brain-worker would so willingly repose himself. Planning to obviate noise, and the use of materials to this same end, are both in their infancy as regards domestic architecture, apart from one or two somewhat freakish experiments in exhibitions.

On the service section of the home there is little need to dwell. Here, again, the line of approach is that of a careful study of the actual processes of work involved in each department, the sequence of events, and planning to facilitate them.

Modern designers have achieved some wonderful results in this direction, particularly as regards kitchens and their equipment. Of special interest are the tiny fitted kitchens of one of the Housing Schemes at Frankfurt—designed by Ernst May—for the organisation of which a woman architect, Madame Greth Lihotzki, was responsible.

These kitchens have both gas and electric cookers, fitted storage for all articles of food and utensils, built-in sumps in the work table to receive potato peelings, etc.; and a window giving on to the living-room, so that children can be under observation while cooking is in progress. The arrangement of these kitchen units is the outcome of a close study of German living conditions and the functioning of service.

It is not possible to cite the many ingenious devices designed to facilitate domestic labour. But one in particular may be mentioned in passing; and that is the system installed in a block of Parisian apartments, designed by Henri Sauvage, by which all kitchen refuse from each

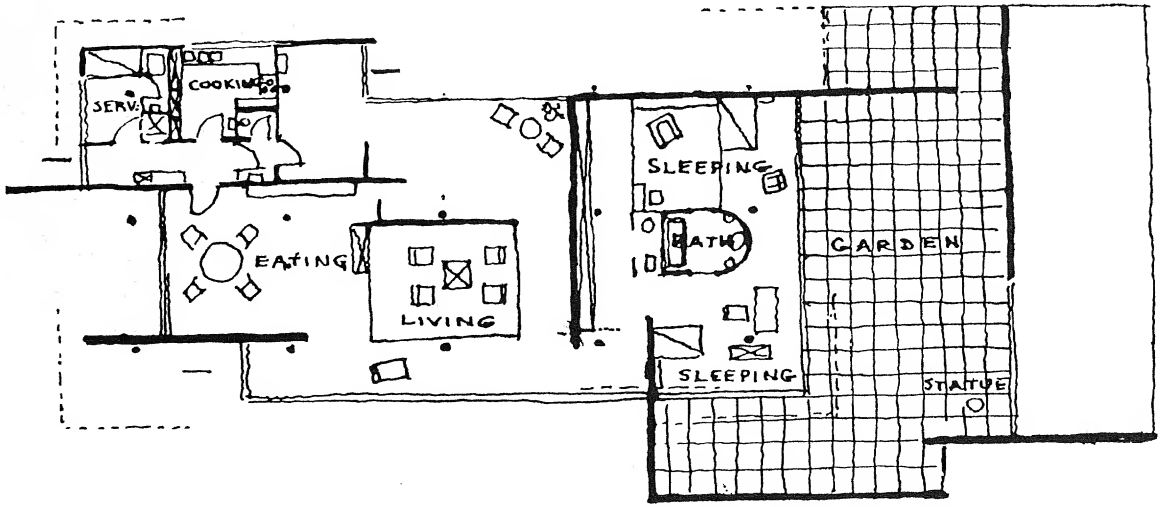

FIG. 103.—An interesting and novel conception of a small dwelling with a walled garden. Spacially, interior and exterior are united, portions of the glass screen walls being lowered below ground by electricity. Designed by Mies van der Rohe, one of Germany's most creative modern architects, and shown at the Berlin Building Exhibition of 1931. In this conception Mies has revived the ideals of plan division originally enunciated in the work of Frank Lloyd Wright.

apartment can be shot to the basement *via* a self-cleansing chute, a water seal preventing any noxious odours from re-entering the kitchens.

Apartment house and small town dwelling design, and that of the so-called minimum dwelling (which was recently examined by the International Congress of Modern Architecture) are all problems of modern architecture, with their own programmes and solutions. For each solution an exhaustive examination of conditions, of the related requirements, and not a policy of follow-my-leader, is the only method of approach which will result in planning progress (Figs. 98 and 103).

VIII

Modernism and Architectural Education

THE foregoing pages have been devoted to various departments of architectural design; and there has been an attempt in some cases to analyse the stages leading up to the modern movement, in the effort to show —particularly in that section devoted to ' construction '— that it takes its place quite naturally in the chain of structural evolution. Its brusque arrival on the scene during the post-War years, and its remarkable extension at the present time, are no doubt due to the sudden expansion of forces which have long been pent up, and which the social revolution resulting from the War has liberated. Development seems the more rapid because for many years architectural design has not kept pace with engineering development. Since the cast-iron of the Crystal Palace the mechanism of structure has made remarkable strides; but its influence on architectural expression has remained in arrears which, in computation of time, can be reckoned as from fifteen to twenty years.

There is, therefore, nothing really surprising or unusual in the present strong architectural response to engineering influences. It is tending at the moment towards the extreme stage, which is desirable in order that clarity in ideals may be established, and that the cluttered overlay of architectural sentiment may be lifted for sufficient space to allow us to appreciate the bare bones of architectural form beneath. Once these elementary forms are appreciated, the

process of emphasising and enriching them may begin; for the return of phantasy, the natural desire to appeal to the whole range of human emotions, is inevitable. The designer is an expressionist, and expression should be free and spontaneous (Fig. 101, page 202). It cannot be confined within the limits of any formula, even those of purity, or refinement, without the ultimate risk of producing artistic sterility.

If, however, questions of expression are put aside, the romantic as well as the functionalist, and the real contribution of 'modernism,' is examined, we find that it resides very largely in a revived conception of 'orderliness.' Modern design is basically that in which orderliness is cultivated in every department of the architectural problem. In the plan, it is found as that intensive study of requirements which leads to proper correlation of plan elements, and finally to simplification. The planner first considers many factors; he reduces them, by organisation, to fewer factors. These reduced factors he models and adjusts to the limits of simplification, tending always towards the ideal, which is unity, for the single unit is the ultimate simplicity. And then the designer, in his final gesture, lays out his elements in a smooth rhythmic harmony of form; this harmony of form is the dominant characteristic of his expression. Everything—decoration, enrichment, emphasis and embroidery—depends for its success on the quality of the underlying form. Design, in this case, is more than skin deep; it permeates the fibre of the structure, and no essential feature of it can be suppressed without, as it were, rending the fabric (Fig. 105).

In the best modern work, this intense cohesion is strongly apparent. The presence, or otherwise, of this closely-knit relationship of all the elements is one of the tests which can

be applied to the genuineness of modern expression in architecture.

The external forms may be severe and stark, as is found in some of the designs of Walter Gropius. They may depict the cult of pure geometry, as in the work of Le Corbusier and Jeanneret. They may be emotionally romantic, as in the case of Tengbom's Högalids Church in Stockholm. But the expression is merely the mood—inspired by the subject—in which the architect is for the time being absorbed. Whatever the mood may be, behind it lies the control of the mind, with its command of essential order. Design is ordered arrangement.

Whether the elements be rich and elaborate, or restrained and simple, matters little. For the test of architecture is not one of taste; the test of taste breaks down at once for lack of accepted standards (Fig. 104).

The ordered mind may exist in embryo in the architect; but in nearly every case it requires to be cultivated by training. To this end, architectural education through organised machinery is necessary.

The architectural school is theoretically justified in its existence. But architectural educationists, to be successful, must first be clear as to their aims, and secondly must find a method. The system of training which is based upon the accumulation of traditional or modern elements, the acquirement of a vocabulary of structural and decorative forms, is not sound in its fundamentals. The possession of a dictionary of words does not make a writer. Words have meaning only when ordered by thought.

Therefore, in architectural education, the reason behind each element of form, structure, or decoration, is more important than the remembrance of the element itself. Only

by realising the cause can the value of the effect be awarded its true weight of importance.

The student, predisposed to architectural study, but untrained, has, as a rule, a genuine fertility of imagination. It is possible—too easily, alas !—to educate this student to the point where a training has been acquired, but where imagination has almost entirely disappeared.

To remedy this state of affairs, architectural education itself requires the clarification of the modern outlook. The old academic road, with its traditional halting-places under the shelter of the Great Periods, starts boldly, but leads to nowhere in particular. Into the systems of training for the architectural profession the introduction of a process similar to that which has been witnessed in building development seems inevitable; namely, the casting aside of all routine and traditional methods, an examination *de novo* of what should be the real structure and form of the teaching system.

It is necessary for the modern student of architecture to assist himself by improved methods of organisation, as well as by better organisation of his own mental processes. He must not only apply higher powers of analysis, and keener critical faculties, at every stage of his creative imagining, but he must also think logically and practically about problems of practical organisation of work in both bulk and detail. Nowadays no single link in the chain of processes must be weak, no single factor must be overlooked, if future success in projects of ever-growing magnitude is to be achieved.

To realise this fact, one has only to read the accounts which have been published[1] of the work which it was neces-

[1] 'The Architectural Forum,' 1930-1.

sary for the architects to organise and control in the execution of the Empire State Building in New York, by Shreve, Lamb & Harmon. Here is a building, the tallest in the world, completed in just over twelve months from the time that the erection of the steelwork was commenced. It involved scores of fresh problems, of design, of construction, of building organisation, not to mention preliminary finance. Yet all these problems, some of them making demands onerous even for the most experienced specialists, had to be met and solved in definite form in an astonishingly short space of time. No architect could afford to hesitate, to make basic blunders, or even detail errors, in a building of such magnitude as the Empire State Building, for each element of failure would be multiplied by too high a coefficient.

The task of organisation involved was tremendous. And the point of efficiency reached in effecting this organisation was equally tremendous. No architect of the old school, with happy-go-lucky methods, obsolete equipment, and a limited outlook (let alone experience) could even approach the fringe of a big problem of this kind. Problems of the type and magnitude of the Empire State Building are new; and they make necessary a complete revision of our whole outlook on the architect's work and methods of training. Either the architect must re-organise to meet the new needs of to-day and to-morrow, or play a secondary rôle.

Organisation, the basis of architectural design, is also the basis of the builder's work. Builders and architects alike must revise their processes, much in the same way that old-established industries must bring their methods up to date in the fight for existence.

The first step in this process should be an improvement

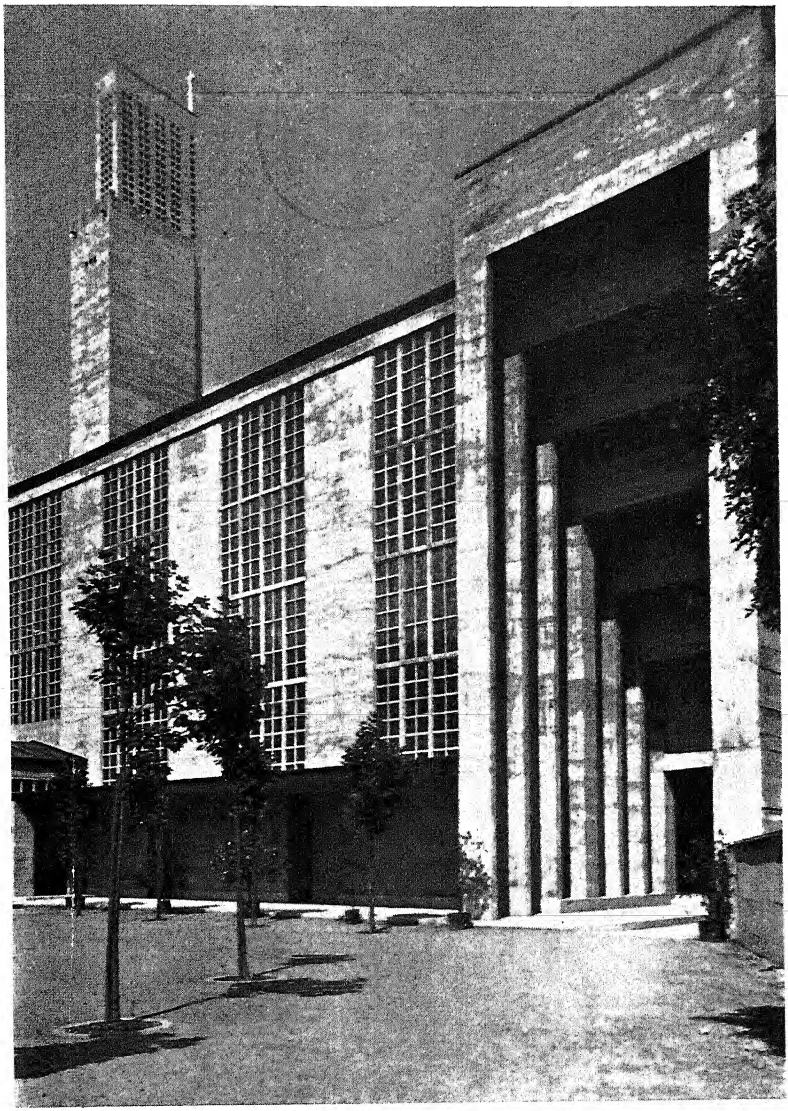

FIG. 104.—Exterior of the concrete church of St. Antoine at Bâle. Karl Moser, architect.

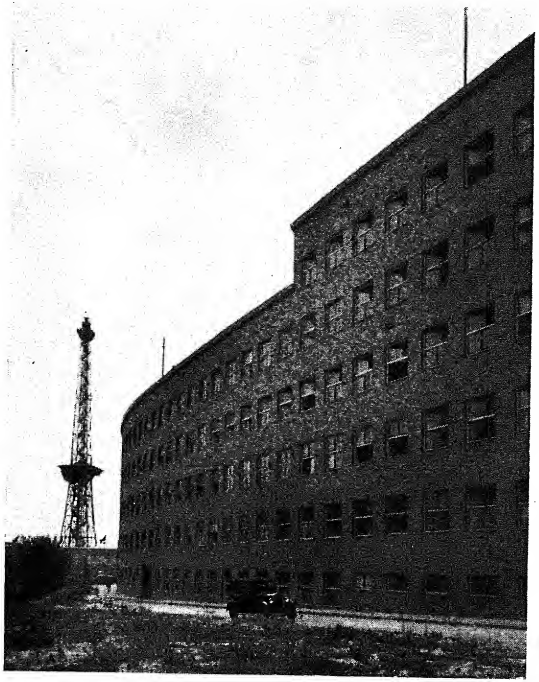

FIG. 105.—Flank of the Berlin Broadcasting building, by Hans Poelzig.

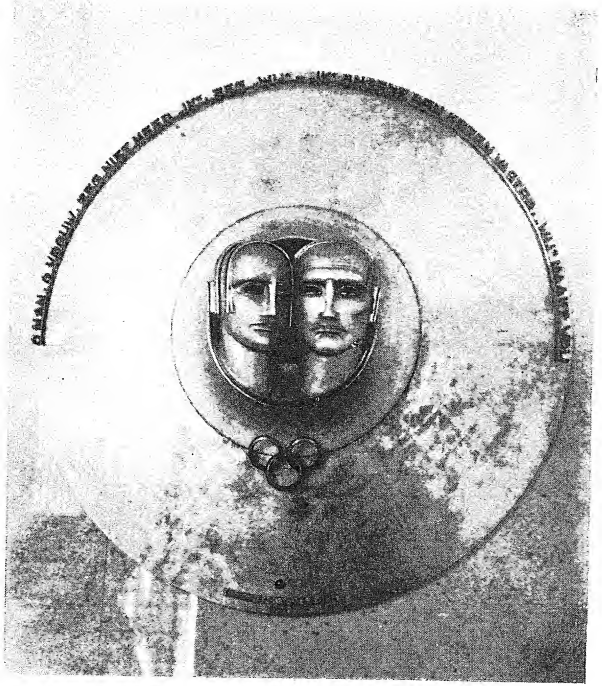

FIG. 106.—Polished metal sculpture in the Hall of the Vol Harding Co-operative at the Hague.

in methods of education in all schools training for architecture, building, and allied activities. The use of the time schedule, which is really nothing more nor less than a rationally organised programme of work, and chart of processes, should be taught in schools, and extended in practice. Organisation of work, avoidance of waste in methods, and consequently in time and money, should be a subject stressed in the curriculum. Questions of economics, of building finance, should be studied far more than in the past, and a more intensive study of constructive engineering, of old and new building materials, should go hand-in-hand with an improved approach to the study of pure design.

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